

2006

Technology integration for teaching and learning Spanish in elementary schools: voices of designers, teachers and students

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Technology integration for teaching and learning Spanish in elementary schools:
Voices of designers, teachers, and students

by

Eduardo García Villada

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of
DOCTOR OF PHILOSOPHY

Major: Education (Curriculum and Instructional Technology)

Program of Study Committee:
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Ames, Iowa

2006

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For the Major Program

*In loving memory of my sister Nora Nelly García Villada and
my father Eduardo Emilio García Ramírez*

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ACKNOWLEDGEMENTS

I would like to thank my wife Susan Vega García and my sons Philip and Tobías for their unconditional moral, physical, and academic support throughout my years of graduate studies. My love goes to them and to *mi familia* in Colombia, Puerto Rico, and the U.S.A for their constant love and support. Special thanks to my parents Eduardo and Maruja, my aunt Nina, and my *suegros* José and Evelyn Vega for always believing in me. Thank you to the members of my Program of Studies Committee for their help, support, mentoring, and understanding of my needs as a student and a scholar. I am especially grateful to my co-major professors Dr. Niki Davis and Dr. Marcia Rosenbusch for successfully leading me all the way through good and bad times in my research and writing. Thank you also to Dr. Mack Shelley and his team at the Research Institute for Studies in Education at Iowa State University, for their assistance with my research and data analyses. Thank you to Dr. George Jackson and Thelma Harding, from the ISU Graduate Minority Assistantship Program, for providing me with the additional financial support I needed to complete my graduate coursework. Thanks to my colleagues from the World Languages and Cultures Department at Iowa State University, and to Professors Jim Dow, Madeline Henry, and Dawn Bratsch-Prince for their support and encouragement of my Ph.D. work.

ABSTRACT

A critical review of the literature on computer-assisted language learning (CALL) research between 1980 and 2005 indicates that no one in the field of foreign language at the elementary school (FLES) has identified what principles might be useful for practice-oriented CALL that is relevant for young learners, and that very little research had been published in the area. To fill this gap, a theoretical framework is proposed to design, evaluate, and use CALL materials for FLES, and the framework is tested in two studies.

The first was a phenomenological investigation of K-6 teachers' projects from a teachers' professional development program on CALL integration with Spanish and content from other subject areas. The projects were analyzed by an expert team of teachers and teacher educators, and the components of the interpretivist CALL evaluation framework were used to judge the projects. A total of 106 K-6 teachers developed 64 CALL thematic projects, but few had strong potential for teaching Spanish language and culture, and most were teacher-centered rather than student-centered. Teachers and experts voices were found to be valuable in CALL evaluation. A second survey study provided children with a voice in CALL evaluation. Children's use of technology to learn Spanish was described along with their attitudes towards these innovations. The variation of individual differences and attitude were analyzed. A survey with two versions (K-2 and grades 3-8) was developed and 2,220 children were surveyed to discover insights into their attitudes. The survey's content validity and reliability were established, and a factor analysis revealed four subscales. Results indicated the curriculum tasks in which children have positive attitudes toward the use of technology-enhanced activities in learning the Spanish language and suggested that students' individual attitudes vary significantly.

This dissertation supports the view that the most appropriate perspective for CALL evaluation is an interpretivist view with multiple voices including teachers and students. Recommendations for future research include application of the framework and research instruments, more attention to be paid to the complex realities and contexts of language interactions by teachers and students in the K-8 classrooms, and research on related teacher professional development.

GENERAL INTRODUCTION

For much of the twentieth century the teaching of foreign languages in the United States has been concentrated mainly at the secondary school level (Branaman, Rhodes, & Rennie, 1998; Herron, 1982). However, there were always, voices that advocated foreign language learning at a much earlier age (Allen, 1978; Andersson, 1969; Kaulfers, 1955; Kunkle, 1975; Modern Language Association of America, 1961; Stern, 1967). However, it was not until the 1990s that a broad and sustained interest in early foreign language learning developed in the United States (Met, 1998; Met & Rhodes, 1990; Rosenbusch, 1995; Tucker, Donato, & Antonek, 1996). The country is still in the early stages of expanding language learning in the elementary schools. Branaman and Rhodes (1998) conducted a national survey of elementary and secondary schools in 1997, and reported that 31% of the elementary schools are offering foreign language instruction. This percentage reflects an increase of nearly 10% from 1987 when 22% of elementary schools reported teaching foreign languages. Similarly, legislative mandates have been passed requiring the study of foreign language, and nine states have included foreign language as a core content area at the elementary school level (Lewelling & Rennie, 1998). The percentage of secondary schools offering foreign languages remained steady, at 87% in 1987 and 86% in 1997. In contrast, countries such as Austria, Germany, Italy, Spain, and Thailand offer compulsory foreign language instruction beginning as early as Kindergarten and first grade (Pufahl, Rhodes, & Christian, 2000). To meet the growing interest in foreign language learning in the elementary schools in the United States, and to teach foreign languages to children using computer-assisted language learning (CALL) as a complementary approach to classroom teaching, CALL for children needs to be informed by recent research trends in technology and education that encourage teacher professional development in the use of technology in learning and teaching (Cunningham & Redmond, 2002; Davis & Thompson, 2005; Oxford, 1998; President's Committee of Advisors on Science and Technology, 1997; Thompson, 2005).

In spite of the slow start in the United States, there is growing interest in foreign language instruction in elementary schools as evidenced by a growing number of books on

the subject (Arizona Educational Information System, 1994; Curtain & Dahlberg, 2004; Donato & Terry, 1995; Gilzow & Branaman, 2000; Lipton, 1988; Met, 1998; Wing, 1996), and by papers in journals (*French Review*, *Foreign Language Annals*, *Hispania*, *Learning Languages*, and *The NABE Journal*), as well as presentations on the topic at conferences (The American Council on the Teaching of Foreign Languages [ACTFL] Conference, The Northeast Conference on the Teaching of Foreign Languages, The Central States Conference on the Teaching of Foreign Languages, The Southwest Conference on Language Teaching, and The Southern Conference on Language Teaching). There are also a number of exemplary projects to encourage foreign languages at the elementary schools, such as the Iowa-Nebraska Technology Challenge Project (IN-VISION [Trayer, 2001]). The IN-VISION project, a 5-year federally funded Technology Innovation Challenge Grant, provided an opportunity to study technology-enhanced foreign language instruction in the Midwest of the U.S. In this project, classroom teachers with minimal experience using technology and no proficiency in the Spanish language received training in both the integration of technology into classroom activities and in the Spanish language. Grade-level classroom teachers received professional development in Spanish language teaching methods and strategies for children. These teachers also received ongoing technology support on-site, and training in the use of technology and integration of the Spanish language into other school subject areas.

There are enough elementary foreign language programs nationally for researchers to study the characteristics of successful programs. For example, Gilzow and Branaman (2000) identified seven successful elementary foreign language programs in the U.S. These model programs start in preschool or the elementary grades and continue through high school, and they represent a variety of possible instructional models and languages. The authors provided descriptions for each of the programs as well as effective strategies and techniques in the areas of technology use, teacher development, and curriculum integration to help those who are interested in establishing similar programs in their school districts.

The use of technology is an emerging emphasis in many of the “exemplary” and “demonstration” projects currently underway. Unfortunately, the use of educational technologies in foreign language at elementary school (FLES) programs often appears

haphazard and not well thought out (Doloff, 1999; Louton, 1995; Meskill, Mossop, DiAngelo, & Pasquale, 2002; Liu, Moore, Graham, & Lee, 2003; Nutta, Feyton, Norwood, Meros, Yoshii, & Ducker, 2002; Padgitt, Rosenbusch, & García, 2000; Shelley, 1996; Wood, 2001; Zhao, 2003). Foreign language educators today recognize the importance of integrating the perspectives of design, learning, and teaching principles into the implementation and evaluation of CALL resources to ensure more effective and innovative teaching and learning in elementary classrooms. Because of the inclusion of technology in K-12 classrooms (Bureau of Census, 2002), methodologies for early language learning also have to be sensitive to more technology-savvy students in technologically-enhanced classrooms. Further, no one in the field of foreign language teacher education has identified in the available professional literature what practice-oriented CALL principles might be useful for young learners.

This dissertation provides a framework for the process of developing, selecting, and integrating educational technologies for foreign language learning in elementary schools. Such framework integrates the multiple perspectives and voices of designers, teachers, and students. With the increasing demand for language teacher specialists in K-8 schools, the need to educate teachers in the best teaching methodologies and in the theoretical and research foundations for design, evaluation, and integration of CALL resources into foreign language instruction remains a challenge for language teachers, teacher educators, and researchers in the field of foreign languages in elementary schools.

Dissertation Organization

This dissertation consists of three articles to be submitted for publication in scholarly journals. These papers together provide a review of the literature analyzed to produce a framework for CALL evaluation, a phenomenological investigation of teacher beginning to use CALL in elementary classrooms, and a survey of elementary students' views of CALL. The voices and opinions of the major stakeholders (CALL users, both teachers and elementary students, and teacher educators) in foreign language learning and teaching at the elementary school are included to develop and implement CALL.

The framework paper, “CALL evaluation for early foreign language learning: A review of the literature and a framework for evaluation,” offers a critical review of the literature between 1980 and 2005 research on CALL evaluation with an emphasis on elementary education. The paper creates an original framework for CALL evaluation that emphasizes issues such as biases in evaluation, classroom-based research, familiarization with research on CALL evaluation, awareness of the limitations of single-sided approaches, and formulation of teacher-developed evaluation criteria. The framework includes the voices of CALL developers, teachers, and students. The approach to assessment of CALL resources draws from an interpretivist perspective of design and evaluation. The paper argues not only that an interpretivist perspective is important, but that it needs to be applicable to the elementary classroom. The organization and analysis of the literature underline three foundational elements that include the perspectives of design, teaching, and learning. The relevance of those multiple perspectives in elementary school student-centered learning with CALL (i.e., contextualization) is analyzed. The paper also discusses evaluation of technology use in the professional development of teachers. Teacher preparation and teacher development programs that infuse technology often require teachers to integrate technology strategies in FLES through project- and content-based student-centered CALL activities. The literature shows some leading programs that require teachers to reflect on their practice using CALL in FLES settings as well as demonstrate an understanding of the connections between national standards in foreign language curriculum and technology standards (Cunningham & Redmond, 2002; Moeller & Park, 2003). However, such a holistic approach is difficult to undertake in sporadic or short-term teacher development programs. As Warford (2003) points out in his research, a redesign and extended sequence in foreign language teacher education programs would be beneficial for integrating the complexity of issues regarding teaching foreign languages at the elementary school that may include the design, development, and assessment of CALL resources.

The second paper is a phenomenology study. “Experts’ views of novice K-6 language teachers’ efforts in technology integration across the curriculum” studies the projects of a group of teachers with limited backgrounds and expertise as foreign language learners and at teaching a foreign language. This paper is an investigation of CALL in

action in the elementary school with an emphasis on teacher development. The CALL projects represent teachers' voices and the voices of experts are also heard. The CALL projects are evaluated by a group of university professors of language learning, university technology professors, and practicing elementary foreign language teachers known for their skills in technology use and integration in the classroom and in teacher education programs, and their success in language teaching. Data from these projects are analyzed and reported with an emphasis on the implications for the professional development of foreign language teachers as well as the types of staff development and support needed in schools where teachers are initiating new language learning projects. This study includes the experts' reflections described in the framework paper, and analyzes the CALL activities developed by teachers. The goal of this investigation is to develop an explanatory schema that helps situate the work of novice language teachers in the broader context needed to develop guidance and training in-service and pre-service teacher education.

The student survey paper, "Elementary students' views on learning Spanish with computers," presents the students' voices and attitudes to the process of designing and implementing CALL activities for young learners. Research on elementary school students' attitudes about learning foreign languages with computers is scarce. The literature analyzed for this paper indicates that children who learn a foreign language have more positive attitudes toward learning the language and achieve higher levels of proficiency than those students who do not learn the language or have less positive attitudes. In regard to the use of technology, empirical research suggests that when children learn a foreign language with television, children report positive attitudes toward learning the language and improve their proficiency in the language. Similarly, in terms of using computers, studies indicate that children express positive attitudes toward learning in general with computers. Older children generally are less positive than are younger children about learning with computers, and children improve their attitudes about learning with computers independently from the type of application or computer task they used. Research on children's attitudes also indicates that well-designed and administered surveys yield reliable and valid results about children's attitudes. Results reported in this student survey paper suggest that students' attitudes are significantly different across learner variables such as grade, gender, home-

computer ownership, and number of years of experience in a technology-enhanced language learning classroom. This paper also provides recommendations for future research in the area of promoting positive attitudes about learning the Spanish language when children make use of CALL activities.

The next three chapters of this dissertation correspond to the three papers that will be submitted for publication in scholarly journals. The papers are followed by a concluding chapter that summarizes the research findings from the three papers and proposes an agenda for research in the field of CALL resources design, evaluation, and use in grades K-8. References will be located after each paper. References and appendixes are included at the end of each paper and chapter.

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CALL EVALUATION FOR EARLY FOREIGN LANGUAGE LEARNING: A REVIEW OF THE LITERATURE AND A FRAMEWORK FOR EVALUATION

A paper to be submitted to
The Computer Assisted Language Instruction Consortium (CALICO) Journal
Eduardo García Villada

Abstract

This paper provides a critical review of the literature between 1980 and 2005 on the evaluation of resources for CALL with a particular emphasis in elementary education. An analysis of that literature indicates that there are a range of approaches to evaluation that have been somewhat monolithic and possibly linked to a postpositivist approach to research in education. Today's elementary classroom, where foreign languages are learned, requires a more interpretivist approach to the evaluation of CALL resources informed by the principles of second language acquisition theory, instructional design theory, early foreign language teaching methodologies, and the connection of foreign language curriculum with other curriculum areas to promote meaningful student-centered interactions. A critique of the literature using factors of multivocality, contextualization, and interpretation, is followed by the proposition that these may provide a framework for future CALL evaluation. The evaluation of CALL has a complex relationship with elementary education and therefore CALL evaluation may best be integrated within teacher education programs.

Introduction

Computer Assisted Language Learning (CALL) materials can be valuable in the elementary classroom (Ford-Guerrera, 1997; Oxford, 1998). CALL materials take a number of forms in elementary classrooms. This paper reviews research on the evaluation of CALL materials for this age group. This review will include guidelines designed to evaluate materials such as practice exercises with audio, text, and video for vocabulary, grammar, and pronunciation, as well as instructional software in the form of tutorials, simulations, games, and problem solving. Researchers and developers of CALL materials have emphasized the need for evaluation of such materials (e.g. Chapelle, 2001).

The evaluation of computer-assisted language learning (CALL) materials intersects instructional design, teaching practice, and learning activities. Over the last three decades, CALL design and its evaluation have gone through a process of conceptualization (Gruba, 2004) and outcomes of this process are tools and procedures developed to evaluate the instructional effectiveness of CALL materials. Accordingly, CALL evaluation draws its foundations from accepted models of instructional design, pedagogy, aesthetics, and usability of the materials (Chapelle, 2001; Decco, 1984; Hamburguer, 1990; Hubbard, 1987; 1988; Laurillard, 1991; Levy, 1997; Pederson, 1987; Phillips, 1986; and Thompson, 1999). As a result, CALL evaluation serves to inform those who design and select CALL materials on how well those materials may meet the needs of foreign language (FL) teachers and students. These needs vary considerably with age and pedagogy in FL education (Curtain & Dahlberg, 2004).

Commonly, the evaluation of CALL has been approached from one of three perspectives: the developer, the teacher, or the student. These single-sided perspectives reflect the postpositivist epistemology that has been a widely accepted and is perhaps the dominant belief system in behavioral and social science research (Guba, 1990). From this standpoint, a main purpose of CALL evaluation has been in relation to the effectiveness or the impact that the use of CALL may have for language learning.

As indicated by Hamburger (1990) and Hubbard (1987), CALL evaluation is too complex to be addressed by single-sided perspectives. In the postpositivist research tradition, where teachers are “guided” by experts, teachers may not feel responsible for doing CALL evaluation. In other cases, due to the complexity of defining their own evaluation criteria and finding time, teachers who do evaluate often adopt evaluation tools that are developed by others who may not have a classroom perspective. When experts do the design, development, and evaluation of CALL materials alone, teachers have little influence over the relevance of those materials to specific classroom and student contexts. To address this issue, teachers’ voices and experiences (Freeman & Johnson, 1998; Widdowson, 1993), and students’ voices (Lincoln, 1995) need to be folded into the discourse of CALL studies to encourage an improvement in current research and evaluation paradigms, particularly in the field of elementary FL education.

As an alternative, an integrated, multiple perspective approach to CALL evaluation research that reflects an interpretivist epistemology (Guba, 1990) could provide a means of integrating these missing voices. The purpose of such an approach is to facilitate professional development for practitioners so that teachers take an active role as researchers, generate their own findings, reflect deeply on their observations, and share their ideas with other teachers (Gage, 1989; Kelly & McAnear, 2003; and Widdowson, 1993). From an interpretivist standpoint, the link between CALL evaluation research and practice indicates a multifaceted and contextualized process where findings take into account diverse voices (Freeman & Johnson, 1998; Lincoln, 1995; and Widdowson, 1993), including the combined perspectives of the developer, the teacher, and the students (Squires & McDougall, 1994).

There is relevant literature for CALL evaluation, but much of it explicitly targets materials for adults, or may not specify an age group. The research on adults may inform evaluation of CALL for elementary schools. However, pedagogical approaches are very different with young learners when compared with adult language learning (Kennedy, 1988; White & Genesse, 1996). Pedagogical approaches for children learning a second language might include songs, rhymes, games, and physical activities, while approaches for adults can include more printed materials and the use of established cognitive strategies, such as first to second language skills transfer. Age groups may also learn differently. For example, research indicates that adults learning a second language learn faster than children, but children learn easier, and over time they obtain better levels of second language proficiency than adults (Larsen-Freeman and Long, 1991). Consequently, it is important to consider young learners, and how teachers work in elementary classrooms and come from that perspective, because an evaluation of CALL materials that is not specific to that context is unlikely to work for elementary education. Approaches to CALL evaluation need to take into consideration what researchers, developers, teachers, and students do with those materials (Chapelle, 1990) especially when they are used in communicative activities mediated through technology with others outside the classroom. In addition to the literature on CALL evaluation, the standards promoted by the general literature on software evaluation (Squires & McDougall, 1994), and the International Society for Technology in

Education (ISTE) technology (Kelly & McAnear, 2003) all identify software evaluation as an expected competency for teachers, student teachers, and administrators.

The purpose of this paper is to argue that an interpretivist framework be used for evaluation of CALL for the elementary classroom. It does so by reviewing prior literature on CALL evaluation over the last 25 years on the topic of evaluation of CALL resources. This paper is organized in two main sections. The first section provides the review and a critique of the literature followed by an alternative framework to inform developers, researchers, and teachers and to improve the evaluation of CALL resources for elementary education.

Recent Reviews of the Literature

Before detailed studies are reviewed, it is useful to critique recent literature reviews on CALL. In 2003, two major reviews of CALL literature were published (Liu, Moore, Graham, & Lee, 2003; and Zhao, 2003). Liu, Moore, Graham, and Lee (2003) reviewed the research literature published during 1990-2000 on the topic of computer use in foreign language learning, with a specific focus on how computer use can enhance language acquisition. Only one database (ERIC) was the source of their data, with analysis of 246 articles published in 21 journals during this time period. Of those 246 articles, Liu et al. examined only the empirical research studies, which narrowed the literature to 70 articles. One important finding in analyzing these studies was that the majority of these research articles focused on college-level research studies, with only two studies investigating K-12 – and specifically, those two articles focused on high school settings. The authors organized the literature by topic or trend, but the specific topic of CALL evaluation and selection was not addressed in the researchers' review.

Zhao (2003) published the second review on technology use and foreign language learning, limited to articles written in English and published between 1997 and 2001. Zhao's purpose was to provide a meta-analysis of effectiveness of CALL materials, in terms of student learning. Again, only one database (ERIC) was searched for articles on computer assisted language learning and second language, with a result of over 300 articles. Zhao applied a number of selected criteria to determine whether there were suitable empirical

studies on effectiveness among these articles. First, Zhao narrowed the number of journals down from 22 to just 5, using quantitative and also subjective processes to determine “representative” and “more research oriented” journals. From these few journals, Zhao applied additional criteria for examining articles from those journals, and ended up with only nine studies that met all his criteria. The review focused on college-level language learners, and evaluation and selection of CALL materials were not addressed. However, Zhao noted a “shocking” lack of research on K-12 second language learning with CALL, and concluded this meant that K-12 second language teachers were not using technology, and that K-12 and university researchers were not interested in conducting empirical research in K-12 second language settings.

K-12 foreign language teachers are using technology in their teaching, although there are few empirical research studies documenting this (Rosenbusch, García Villada, & Padgitt, 2003a, 2003b). Accordingly, based on published reports, this review of the literature considers the specific topic of how K-12 instructors have selected and/or evaluated the CALL materials they use, and the issues that emerge. One expected outcome of this study is to promote and enhance K-12 instructors’ use of technology, as well as to contribute to the body of research in this neglected area.

Selection of the Literature and a Description of the Findings

For the present review, four databases, the Educational Resources Information Center (ERIC), Linguistics and Language Behavior Abstracts (LLBA), Dissertations Abstracts International (DAI), and WorldCat, were searched to find relevant literature from 1980-2005 on the topic of CALL evaluation for foreign languages at the elementary school level. These four databases were chosen as a means of retrieving comprehensive results from the published journal literature, books, and dissertations.

The specific search string used in these databases was “(computer assisted language learning or computer assisted instruction) and (elementary or K-12 or children) and (foreign language or second language or FLES or Spanish) and (software evaluation or software selection)”. In ERIC and the LLBA databases, the search was also limited to only peer-reviewed journal articles. The search produced different results from each database since

these four databases are constructed differently and do not contain the exact same journals or content, though there is some overlap.

For example, the entire search string strategy did not retrieve any records at all in the DAI database. When the keywords “software evaluation or software selection” were removed, the search only produced four citations that, lacking these critical key concepts, were not relevant. Moreover, the DAI database only produced one citation when the keywords “evaluation” and “selection” were excluded, but the keyword “software” was included. These results indicate a lack of research at the dissertation level conducted on this topic from 1980 to 2005.

Similarly, the LLBA database did not produce any results with the entire search string, but when the keywords “software evaluation or software selection” were left out, the search produced 16 citations. When the keywords “evaluation” and “selection” were excluded, but the keyword “software” remained in the search string, two citations were found. Again, database search results that omitted the key concepts of “software evaluation” and “software selection” were judged to be not relevant to the specific focus of this paper.

The search in the WorldCat database produced eight records, and the results from the ERIC database yielded 10 citations when the entire search string was used. To verify that records from these four databases that lacked the keywords (and thus the key concepts) of “evaluation” and “selection” were not relevant, abstracts of these materials (research articles, dissertations, books, and web resources) were examined, and an initial set of 30 records was selected. From these, the cited references or bibliographies in the peer-reviewed articles were also reviewed.

Based on this review, the record set was then narrowed to only those materials addressing selection guidelines and checklist criteria, which resulted in a set of only 24 citations. Table 1 presents those citations, listed in alphabetical order. Of these 24 entries, only one article focuses on K-6 (Hertz, 1984), three other citations cover K-12, another covers the specific grades of 9-12, and three more cover K-16. The remaining citations cover college years, or do not specify a particular grade focus. The 24 records included 14 journal articles, 5 books, 2 ERIC documents, and 3 Web resources.

These results indicate that little research was published in the decades between 1980 and 2005 on the topic of CALL evaluation for foreign language learning in elementary schools. In part, these results corroborate the findings of Liu et al. (2003) and Zhao (2003). However, the reviews by Liu et al. and Zhao confirm that there is a substantial body of research on CALL for adults. While only eight of the 24 citations found in the present study deal with K-12, the remaining 16 articles were still included because they have the potential to guide the research that has not yet been done in elementary schools.

CALL evaluation includes multiple perspectives, particularly the perspectives of teacher, developer, and student. A thorough review of the entries in Table 1 reveals that twenty-two of these works address CALL selection and evaluation from the teacher perspective, six entries from the developer, one was not specified, and one from the student perspective. Note that some works address more than one perspective, so numbers here add up to more than 24. The objectives of each evaluation identified in these studies in Table 1 are as follows: to select CALL materials (11), to establish criteria for CALL selection or design (5), to determine the effectiveness of CALL (2), to judge CALL design (2), to facilitate training in CALL selection (2), to develop an SLA theory in the context of CALL (1), and to submit CALL reviews for publication (1). This suggests that areas of interest to the K-12 community are to provide practical assistance in the selection of CALL materials, and, to a lesser extent, the establishment of criteria for selection or design.

Table 1: Overview of Selected Papers for this Literature Review on CALL Evaluation Guidelines

Author	Evaluation Criteria	Evaluation Perspective	Grade Level	Evaluation Objective
Burston (2003)	CALL software should meet the following requirements: 1) Pedagogical validity; 2) Curriculum adaptability; 3) Efficiency; 4) Effectiveness; 5) Pedagogical innovation. Generic parameters for software evaluation include: 1) Product description; 2) Technical features; 3) Activity procedures; 4) Teacher fit (Approach); 5) Learner fit (Design); 6) Summary including overall evaluation.	Teacher	K-16	to help reviewers recommend software for purchase and submit reviews for inclusion in CALICO Review's online database
CALICO (1983)	These guidelines consider three aspects of software: 1) "preliminary considerations" include description of program, ease of use, intended audience, context of use, reliability of product, time required to use; 2) "pedagogical considerations" include adequacy of content, opportunities for practice and reinforcement; 3) "adaptability to computer medium" include interactivity, documentation, level of difficulty, opportunities for feedback, interaction, and correction.	Teacher	College	to encourage formulation of new evaluation ideas and to guide practice in selection
CARLA (1998)	These guidelines, developed for inclusion of language learning software into a language laboratory database, include: 1) General description; 2) Technical information; 3) Skill focus; 4) Proficiency level; 5) Target audience (age level); 6) Ease of use.	Teacher	K-16	to assist language media center personnel select software for language learning

* NS = Not Specified

Table 1 (continued)

Author	Evaluation Criteria	Evaluation Perspective	Grade Level	Evaluation Objective
Chapelle (1998)	The 1998 evaluation guidelines for CALL activities are framed by the interactionist SLA theory and guided by research on CALL. The evaluation criteria include: 1) Evidence and analysis of learners' language during tasks completion (interactions between computer and learner); 2) Records of learners' introspective evidence about strategies used for SLA with CALL; 3) Assessment of learning outcomes with attention to individualized approaches to assessment; 4) Questions for empirical evaluation of CALL that address the extent to which computer and learner interactions satisfy the conditions proposed by the interactionist SLA theory.	SLA researcher, CALL developer, teacher, and student	NS*	to inform CALL design and research, and to help teachers select and evaluate CALL activities
Chapelle (2001)	The 2001 evaluation criteria need to apply to software, teacher-planned activities, and learners' performance. The evaluation criteria include: 1) language learning potential; 2) learner fit; 3) meaning focus; 4) authenticity; 5) positive impact, and 6) practicality. Guidelines should incorporate: 1) theoretical assumptions about ideal cognitive and socio-affective conditions for SLA; 2) provide guidance for their use; 3) differentiate judgmental evaluation of CALL software and teacher-planned activities from empirical evaluation of learners' performance.	SLA researcher, CALL developer, teacher, and student	NS*	to inform CALL design and research, and to help teachers select and evaluate CALL activities
Curtain and Shinall (1987)	This checklist, adapted from general criteria for evaluation of computer-aided instruction, include: 1) Language features; 2) User characteristics; 3) Instructional strategies.	Teacher (especially pre-service) and student	NS*	to facilitate training in use and evaluation of CALL
Evans and Gibson (1989)	Guidelines assisted an evaluation of CALL materials for a university language laboratory and included: 1) Product description; 2) Language level; 3) Software type; 4) Lesson goal; 5) Strengths and weaknesses; 6) Pedagogy; 7) Pragmatics.	Teacher	College	to train graduate students on CALL evaluation

* NS = Not Specified

Table 1 (continued)

Author	Evaluation Criteria	Evaluation Perspective	Grade Level	Evaluation Objective
Goodfellow (1993)	These research oriented guidelines focus on CALL design for vocabulary and include: 1) Quality of the learners experience; 2) Usability of the learners' linguistic competence data; 3) Validity of the theoretical model of the learners' mental lexicon.	Teacher	College	to inform CALL design, assess language skills, and theorize on learners' lexicon
Hamburger (1990)	The criteria for CALL evaluation depend on: 1) Current teaching methods; 2) Evaluation of CALL as a whole or its modules; 3) Facts and viable theories of language learning; 4) Focus on students' preferences or students' learning and retention of material.	Developer and teacher	NS*	to conclude on student acceptance and on CALL success
Hamerstrom, Lipton, and Suter (1985)	These guidelines, developed for a specific research study, include a checklist with yes/no options: 1) Clear objectives; 2) Correct content; 3) Creative use of the computer; 4) Clear instructions; 5) Effective handling of students' response; 6) Effective computer feedback; 7) Sound motivational devices; 8) Useable documentation.	Teacher	9-12	to verify the success of teacher-made software in learning vocabulary and verbs
Hertz (1984)	These guidelines, adapted for language arts, include a checklist with yes/no options: 1) Suitability and adequacy of features and content; 2) Compatibility with textbooks; 3) Help, feedback, and correction features; 4) Technical requirements; 5) Documentation available; 6) Vendor support; 7) Aesthetics and accuracy; 8) Workability, flexibility, ease of editing; 9) Classroom management.	Teacher	K-6	to select factors that are considered relevant and useful to the evaluator

* NS = Not Specified

Table 1 (continued)

Author	Evaluation Criteria	Evaluation Perspective	Grade Level	Evaluation Objective
Hubbard (1987, 1988)	<p>The 1987 criteria consist of a checklist based on:</p> <ol style="list-style-type: none"> 1) SLA approach; 2) Learning strategy; 3) Pedagogical considerations. <p>The 1988 criteria include three major sections:</p> <ol style="list-style-type: none"> 1) Operational description provides an objective and detailed view of the operation of the software; 2) Teacher fit compares the designer's assumptions about language and learning to those of the teacher; 3) Learner fit relates to the relevance of the software to a specific group of users. 	Teacher and student	NS*	to assist FL teachers in finding the best match between CALL, teaching approach, student needs, and course syllabus
Komoski and Plotnick (1995)	<p>The guidelines are a seven-step process for software selection that include:</p> <ol style="list-style-type: none"> 1) Needs analysis; 2) Specific requirements; 3) Identify promising titles; 4) Read relevant reviews; 5) Preview software; 6) Make recommendation; 7) Get post-use feedback. 	Teacher and student	NS*	to help teachers select software for the subjects they teach
Laurillard (1991)	<p>These guidelines combine components from SLA research and instructional design to:</p> <ol style="list-style-type: none"> 1) Present information; 2) Determine goals; 3) Integrate new and prior knowledge; 4) Observe performance; 5) Provide feedback and conduct assessment. 	Developer and teacher	College	to find a theory of adult SLA in a CALL context within the classroom
Lillie, Hannum, and Stuck (1989)	<p>This checklist includes descriptive information based on three aspects of software quality:</p> <ol style="list-style-type: none"> 1) Instructional content; 2) Instructional procedures; 3) Instructional management. 	Teacher	K-12	to assist teachers conducting software evaluations
O'Neal and Fairweather (1984)	<p>These guidelines, intended for developer training, include four dimensions of the authoring systems:</p> <ol style="list-style-type: none"> 1) Power; 2) Ease of use; 3) Productivity; 4) Cost effectiveness. 	Developer	NS*	to evaluate authoring systems and to inform design of instruction

* NS = Not Specified

Table 1 (continued)

Author	Evaluation Criteria	Evaluation Perspective	Grade Level	Evaluation Objective
Owston and Dudley-Marling (1986)	These guidelines use a four-point scale (exemplary, desirable, minimally acceptable, deficient) to rate: 1) Content; 2) Instruction; 3) Technical adequacy; 4) Documentation; 5) Modeling (for simulations); 6) Short written narrative of uniqueness of software.	Teacher	NS*	to simplify choices and to overcome limitations of current evaluation approaches
Pederson (1987)	CALL evaluation should look "for clear educational objectives, a specific target audience, and an adequate evaluative consensus from classroom teachers, students and CALL experts." The evaluation criteria examines: 1) Adequate description of materials and lesson contents; 2) Theoretical conceptualization and adequate descriptions of research designs; 3) Research hypothesis based on language learning theory; 4) Duplicability of results attributed to CALL; 5) Generalization of outcomes from specific contexts.	SLA researcher, CALL developer, and teacher	NS*	to examine emerging CALL foundations that support previous research in education and in SLA
Phillips (1986)	These guidelines, based on the analysis of two language programs, include: 1) Activity type; 2) Program focus; 3) Learner focus; 4) Language difficulty; 5) Classroom management; 6) Learning style.	Teacher	NS*	to analyze successful CALL design and to determine principles for CALL progress
Strei (1983)	This checklist aims at standardizing software evaluations for the FL teaching profession and includes: 1) Descriptive bibliographical information; 2) Target population; 3) Hardware and technical requirements; 4) Instructional design features of the software; 5) Language skills developed; 6) Appropriateness for user; 7) Type of exercises provided (implies drill); 8) Summary with final recommendation to adopt or not.	Teacher	K-16	to guide the process of materials selection

* NS = Not Specified

Table 1 (continued)

Author	Evaluation Criteria	Evaluation Perspective	Grade Level	Evaluation Objective
Taylor (1985)	These guidelines for software evaluation include: 1) Description of objectives, prerequisites, content and structure documentation, and potential uses; 2) Appraisal of major strengths and weaknesses of software; 3) Judgment based on content, instructional, and technical criteria; 4) Overall recommendation.	Teacher	K-12	to aid the selection before purchasing and to identify sources of evaluation
Thompson (1999)	This CALL evaluation taxonomy is based on: 1) General criteria that include description of the program, its operation, and its special features; 2) Pedagogy by skill that includes specification of input, activities, interface, strategies, and tools for speaking, reading, listening, writing, script, vocabulary, and pronunciation.	Teacher	NS*	to guide the development and evaluation of CALL resulting in searchable database
Treadwell (1999)	These guidelines, intended for websites, include a five-point rating scale (1=low though 5=high) given to the: 1) Quality of the presentation; 2) Quality of the content and relevance to curriculum.	Teacher	K-12	to help teachers find relevant content and curriculum

* NS = Not Specified

Critical Analysis

The critical analysis in this paper is founded in interpretivism (Guba, 1990). Therefore, it is important to understand some of the foundations that influence and support the evaluation of CALL resources from the combined theoretical perspectives of CALL design, and foreign language teaching and learning.

Willis, Jost, and Nilakanta (2002) articulate the value for adopting an interpretivist approach in instructional design development and research. According to Willis, Jost, and Nilakanta (2002), a major difference between research from the postpositivist and the interpretivist paradigms resides in the goal of research. Postpositivism assigns universality to the research conclusions and seeks the "Truth," while interpretivist research seeks understanding. "Truth" implies more control over the research process, while "understanding" implies production of knowledge in context. These paradigmatic contrasts were also studied by Levy (1997) as they pertained to the field of CALL design and

research. Willis, Jost, and Nilakanta (2002) have called attention to the foundational issues of research on instructional design and technology (IDT). Based on the assumptions outlined by Willis, et. al. (2002), the spirit of interpretivism in IDT may be captured in three elements. The first element is *multivocality*: interpretivism allows multiple perspectives and voices on the topics of educational research and practice. The second element is *contextualization*: interpretivism emphasizes local and authentic realities instead of the “one size fits all” that is sought in educational practice. The third element is *interpretation*: interpretivism allows the unfolding of meaning through the interpretation and the insights of the researcher and the practitioner. Interpretivism provides guidance, not specific rules to interpret knowledge about the world. An interpretivist view of the relationship between theory and practice in educational technology constitutes a theoretical foundation for a holistic CALL evaluation method that combines elements of design, teaching, and learning in local and authentic classroom settings. Squires and McDougall (1994) proposed a general software evaluation approach or “perspectives interaction paradigm” (PIP) that includes the designers’, teachers’, and students’ perspectives in the evaluation of software. The PIP may be valuable for CALL evaluation in elementary school contexts.

Discussion of the Literature

This section discusses the 24 publications selected in this literature review (see Table 1) in relation to the three elements important in interpretivist research, namely multivocality, contextualization, and interpretation. These elements may propose a framework of interpretivist CALL evaluation. The discussion concludes with a review of those papers that attempt to consider several of these elements together.

Multivocality

Multivocality refers to the diversity of voices and points of views from the participants in a specific setting, as opposed to a single or unified, monolithic voice or perspective (Willis, Jost, & Nilakanta, 2002). Fourteen of the 24 publications selected for this review take the single perspective of the teacher. For example, authors such as Evans and Gibson (1989), Lillie, Hannum, and Stuck (1989), Hertz (1984), and Strei (1983)

proposed checklists from the teacher perspective for FL software evaluation (Table 1; column 3). Similarly, Hamerstrom, Lipton, and Suter (1985) and Phillips (1986) developed guidelines from the teacher's perspective for software evaluation in the context of specific projects whose goals were to develop CALL materials. In few cases is the perspective of students combined with that of teachers (Curtain & Shinall, 1987; Hubbard, 1987; 1988; Komoski & Plotnick, 1995). Only rarely are the designers', teachers', and students' perspectives taken into account and combined into a holistic view (Chapelle, 1998; 2001) to provide the best multivocality.

Further detail is now provided for six of the papers, five from the perspective of the teacher and one from the designer. The Computer Assisted Language Instruction Consortium (CALICO) journal has considered software evaluation a topic of interest to its readers since the early 1980's (CALICO, 1983; Burston, 2003). In 1983, in a column titled "Wanted: Courseware Reviewers and Reviews," the journal editors provided guidelines for consideration by software reviewers, and invited the readers to add more ideas into those proposed guidelines. In the following issue of the journal, CALICO published an article where Strei (1983) argued that current forms of software evaluation were "excessively wordy and imprecise or so brief," and that a set of standardized evaluation guidelines would benefit the language teacher profession. Thus, he developed a three-page checklist to guide the evaluation of CALL materials for selection. The checklist was intended for computer drills and provided space for technical information related to the software, the different levels of students' language skills, and the language skills being practiced. The guidelines did not go beyond descriptive features of the software and disregarded student views. Student's prior knowledge along with the students' preferred language learning strategies and diversity of learners were issues not considered.

Hertz (1984) proposed a checklist for evaluation of language arts computer materials that may have application in the assessment of CALL materials. The checklist is a series of questions related to the description of the material, with "yes" and "no" response categories. Hertz's checklist considers the single perspective of teachers and assumes an average type of learner. Despite some considerations about the learner characteristics, the checklist does not provide space for adaptability to learner diversity, nor does it give consideration to the

teacher's point of view. Although it may be assumed that the designer's view is included in Hertz's checklist because there are questions about aesthetic aspects of the materials, but the checklist fails to consider basic principles of instructional design such as instructional methodologies and strategies in the presentation and design of instructional activities. The designer's view is therefore not valuable.

Taylor's (1985) guidelines for software evaluation are provided from the teacher's perspective, but position teachers as passive consumers of knowledge prescribed in the guidelines. Instead of teachers developing their own selection criteria, teachers' views are excluded, and they are directed instead to rely on the recommendations given by organizations that produce a significant number of software evaluations, such as those by the Association for Supervision and Curriculum Development (ASCD) and the Children's Software Review. Each publish a fee-based searchable database called "Only the Best" and "Children's Software Finder" respectively. These databases provide reviews of commercially available multimedia products, including software, videogames, and websites. Similar to Taylor's guidelines, the guidelines used in these databases lack consideration from people who have knowledge about elementary classroom practices, especially teachers, about specific software titles.

Laurillard (1991) approaches evaluation from the designer perspective with the student in mind. She grounds her guidelines for CALL design on psycholinguistics research (the study of the interaction between language and the human brain), and particularly on second language acquisition. Laurillard emphasizes the importance of the use of language learning theory in the design of CALL materials. She is interested in the demands imposed on learners when they learn language with the goal of obtaining communicative competence, and argues that in such situations learners are overloaded with cognitive demands. Thus, learners' prior knowledge has to be considered before giving consideration to instructional design principles in CALL design. Those principles, according to Laurillard, are understood as the classical elements of computer-based instruction, and they include aspects such as presentation of the information, triggers of motivation, opportunities for practice, and feedback for remediation. Laurillard predicts success in CALL design when learner

variables and design principles that are both based on SLA and instructional design are taken into account.

These six examples demonstrate the lack of depth of a single perspective, which becomes even more problematic when the lack of contextualization is considered.

Contextualization

Contextualization involves the identification of the particular conditions in the settings under which the CALL materials are being used. With the exception of Hertz (1984), the majority of CALL evaluation guidelines discussed so far are intended for college level students or do not specify a target grade level. For example, neither the guidelines provided by CALICO editors (1983) nor Strei's (1983) checklist consider either the context or local situations surrounding the software under use. Those who do specify a pre-collegiate level in their guidelines are Taylor (1985), Hamerstrom, Lipton, and Suster (1985), Lillie, Hannum, and Stuck (1989), and Treadwell (1999).

During the 1980s, CALL evaluation was primarily completed with checklists that aimed to evaluate CALL materials from a technical, postpositivist paradigm. These checklists include features of the products, technical requisites, suitability and adequacy of the activities, documentation, strengths and weaknesses, and appraisals in the form of an overall recommendation. Taylor (1985) argues that teachers have to evaluate context, and judge how appropriate the instructional strategies are for their particular classroom situations, but his guidelines position the teachers as passive consumers of knowledge. Even when Taylor asks how the software matches local and state curricular needs, the author does not articulate a practical way to put the evaluation in context, and questions about how relevant the features of the software might be in different contexts are not included.

In the 1990s, evaluation checklists continued to be used (Laurillard, 1991; CARLA, 1998; Thompson, 1999), but their use was criticized in favor of empirical evaluations of CALL use in classroom contexts (Chapelle, 1998). For example, Laurillard's (1991) guidelines consider the student variables, but the author does not address the pedagogical issues when CALL materials are used in classroom contexts. Once again, teachers are seen as consumers of this body of knowledge prescribed in the guidelines, and it is implied that as

long as CALL is developed using “theory,” teachers and students will be satisfied when they engage with the CALL materials, and in reality that is hardly the case. CALL evaluation goes beyond the evaluation of CALL design.

Recently, Susser (2001) came to the defense of checklists. He concentrates on six of the common arguments against checklists, namely, the “yes/no” format, the distance from classroom realities, the lack of experimental evidence, the commitment to specific methodology, the validity, and the required expertise for use. Susser argued that a possible reason as to why checklists have been targets of criticism is that there are two opposing principles of pedagogy (i.e., technical and humanistic) that place practitioners in different camps of preference over checklists. The technical camp favors checklists and the humanistic perceives them as a presence/absence dichotomy that is opposed to choices. One could interpret Susser’s explanation to be founded on the postpositivist/interpretivist contrast expressed by Guba (1990).

Over the years the evaluation guidelines have become more contextualized. For example, research on elementary foreign language program evaluation (Rosenbusch, García Villada, & Padgitt, 2003a) shows that language learning outcomes by young children in technology enriched environments need to be studied in the context of the specific program, include the perspectives of teachers and students, and be analyzed longitudinally over time. Similarly, the checklist approach to CALL evaluation from the 1980’s and 1990’s have changed to favor the use of multiple research methodologies for CALL evaluation where classroom-based research and student language outcomes are analyzed. CALL usage and its evaluation in the context of the elementary classroom are not simple versions of college classroom settings, but very different. However, while the context is important, the guidelines are yet open to interpretation.

Interpretation

Interpretation implies that the evaluator’s critiques and reflections have a necessary personal and subjective component. This element of interpretivist evaluation is frequently overlooked by those who have proposed CALL evaluation guidelines. For example, Strei (1983) expected the evaluator (the teacher) to provide comments and a summary of the

judgment to justify adoption or rejection, but did not articulate how to teachers might critique or reflect, in addition to using his checklist. Similarly, teachers who use Hertz's (1984) checklist are not encouraged to provide an opinion or to give an appraisal of the software under consideration. Interpretation in Hertz's checklist is addressed by questions with a "yes/no" response category. For example, using an interpretivist evaluation approach, the question: "*Does the level of difficulty vary according to the demonstrated ability level of the student?*," is likely to merit a reflective answer rather than a simple "yes/no" response. As an alternative to the use of checklists, Owston and Dudley-Marling (1986) suggested a short written narrative of the software's uniqueness, but did not elaborate on the nature of the narrative. The element of interpretation is also missing in the guidelines formulated by Hamerstrom, Lipton, and Suter (1985), Phillips (1986), and Taylor (1985). Guidelines from these authors do not consider any narrative appraisal or interpretation or opinion in CALL evaluation.

From a CALL developer's perspective, O'Neal and Fairweather (1984) argue that the most important part of an evaluation is to complete a needs analysis of the "training and development" needs before selecting CALL development tools. Instead of focusing on the evaluation of CALL materials, the authors concentrate on the issue of productivity (the most appropriate and cost-effective authoring tool) and the time it takes for a developer to learn and develop an hour of instruction. Even though O'Neal and Fairweather proposed a multivocal and contextualized evaluation by maintaining that the evaluation model that yields the right authoring tool for maximum effectiveness in a given context uses a combination of multiple lessons, multiple users, and multiple developers, the authors assume a postpositivist view of evaluation by suggesting that "above all, throughout the evaluation, [evaluators] maintain the distinction between those notions that are based on evaluative data and those that are based purely on opinion whether [the evaluator's] or others" (p. 46). The value of multiple methodologies (empirical and judgmental) to examine CALL is not valued by these authors as it has been suggested by Chapelle (2001).

In the elementary school context, interpreting software may be restricted by the fact that teachers are busy and find it difficult to evaluate CALL in depth before use. It is also

difficult for elementary FL teachers to get involved as CALL designers and/or offer their reflections on their CALL practice (Rosenbusch, García Villada, & Padgitt (2003b).

Working towards interpretivism

With the increasing complexity of CALL evaluation, researchers have begun to bring in multiple perspectives, context, and interpretation to their evaluation guidelines. Some of the authors and works included in this literature review have taken more ambitious approaches and have attempted to address several of these three elements of interpretivism in combination, sometimes with varying degrees of success.

Curtain and Shinall (1987) propose a program for training teachers in the use, evaluation, and selection of technology for FL learning. The authors stress the importance of multiplicity of voices, and, in theory, context, and interpretation in this teacher training, and outline the content to be included in teacher training in CALL evaluation. They use the concept of multiple voices (teachers' and students'), and make explicit the importance of teachers developing insight into evaluation and creating their own evaluation criteria. Curtain and Shinall express their concerns about the several roles that teachers are asked to play when using CALL. Teachers sometimes assume the responsibilities of both developing and teaching with electronic materials. Thus, according to these authors, it is essential to offer teacher training that includes development of expertise in content, learning theory, lesson design, software evaluation, and an appreciation for computer programming. In the opinion of Curtain and Shinall, training should also prepare teachers to judge, try out the materials in their own context, and test if their initial impressions change over time. They argue that training in evaluation is important, and that the CALL content and the needs of students are addressed in this type of training. Although the program that Curtain and Shinall propose is ambitious, they finally settle for a series of open-ended questions, or a checklist, that lacks an organizational scheme. The questions on the checklist appear to comprise random criteria and a list that could be answered with "yes" or "no" responses. For example, the question "is the material authentic culturally?" (p. 285) can be answered with a single "yes" or "no" without elaboration. Even though the teacher training program they propose is feasible, their decision to use a checklist is due perhaps to practicality. In

practice, Curtain's and Shinall's evaluation falls short of including the interpretivist elements of contextualization and interpretation.

In addition to the teacher training issues in CALL evaluation and development, researchers have also addressed multiple elements of the interpretivist approach to evaluation. For example, Hubbard (1987, 1988) suggested software evaluation guidelines that include multivocality and contextualization, but he did not consider interpretation in the checklist. Although, working mainly from the single point of view of the instructional designer, Pederson (1987) proposed guidelines that consider the element of contextualization, and the relevant foundations in conducting research on CALL. Pederson maintained that "CALL is highly context-bound and must, therefore, take such variables as learner differences, learning task, and the computer's coding options into account" (p. 100). This may translate into the idea that multiple perspectives must be used to evaluate CALL, a perspective that considers the learner, the teacher and the designer points of view. In fact, Pederson noted that "the wise language teacher should examine evaluative research reports carefully for clear educational objectives, a specific target audience, and an adequate evaluative consensus from classroom teachers, students and CALL experts" (p. 109). Pederson situated the learner at the center by maintaining the opinion that "because language is processed internally by individuals with many different attitudes, learning styles, and learning preferences, the key learner variable(s) that are called into play must be considered in research design along with the task(s) and coding element(s)" (p. 115). In essence, Pederson proposes a more comprehensible approach to CALL evaluation because it considers multivocality and contextualization. However, these guidelines are lacking on the area of interpretation because no provision is made to include an interpretation of what happens in classroom contexts when teachers and students interact with each other and with the CALL resources.

Other authors such as Evans and Gibson (1989) developed CALL evaluation criteria that were based on elements that the authors used to develop a prototype for a searchable database of FL software for college undergraduate students who were using a computer laboratory. The criteria were packaged as a template, and graduate students (mainly high school teachers) in a technology in the FL class conducted the evaluations. This information

was ultimately used to provide recommendations for software purchases in the laboratory. The organization scheme provides descriptive information, and the content and goals of the materials being evaluated. However, critical information such as the perspective of language students was not based on student performance or on any observation of authentic classroom use. Instead, the authors provided a general statement citing “very positive” student satisfaction with the format of the reviews and the appearance of the compilation. Although the overall appraisals and judgments made by graduate students were an important component of the project, classroom use and contextualization of the software were not considered. One interesting aspect of this evaluation procedure is that it included conflicting or contradicting reviews that may account for the multiplicity of voices and opinions in an interpretivist evaluation. However, a holistic evaluation with the additional perspectives of teachers and designers, along with elements of judgment, interpretation, and experimentation, was lacking.

Hamburger (1990) argued that CALL evaluation depends on answers given to questions that address language learning goals, evaluation standards used to judge CALL, second language and linguistics theoretical perspectives, and whether the evaluation focuses on the whole CALL system or on its parts. The author gives emphasis to the effectiveness of CALL as a way to provide an “impartial assessment of the CALL system” (p. 24). He also stresses the issue of the context in which teachers and students provide a perspective in the design and interact with CALL (i.e., multivocality and contextualization). However, Hamburger does not agree with evaluations that are led by a teacher who is also the designer because he believes that such evaluations contain flaws in their experimental design. In this sense, Hamburger favors a postpositivist view of CALL evaluation that is focused on retention of learning, impartial and external evaluations, and effectiveness of the CALL system. Clearly, the element of interpretation is missing in these guidelines. According to Hamburger, CALL evaluation should focus on the content and expertise of the system, as well as on the representation that the system has of the student responses in context and on the student’s spontaneous actions. Hamburger concludes that CALL evaluation depends on teaching objectives, theoretical perspectives, roles of the CALL system, and the stages of CALL development.

Goodfellow (1993) developed guidelines for the development of software for vocabulary learning from the “teacher as designer” perspective. The author maintained that interest in learning process and language theory “has to some extent replaced the measure of performance as the object of CALL evaluation” (p. 101). Later, Goodfellow (1995) exemplified the combination of CALL design guidelines and language acquisition models with a program entitled “Storyboard” that “illustrate[d] the complexity of the interrelation between vocabulary knowledge, reading ability, inference and production skills” (p. 210). Goodfellow’s example illustrates a CALL evaluation that considers the user and the context, but fails to provide an interpretation of the learning experience by limiting the inclusion to the learner’s variables to only that of data collected on the learner’s linguistic competence in a CALL context and excluding the learner’s affective reactions and experiences while learning with CALL.

Komoski and Plotnick (1995) proposed a list of seven steps for general software selection that an evaluator should take into account when conducting “responsible software evaluations.” Their evaluation was taken from the teacher perspective and considered what is important for students. In the opinion of Komoski and Plotnick, the evaluators should first establish the objectives for the evaluation by asking questions such as why is the software needed?, and what are the evaluators’ needs? After that, the evaluators specify type of the software that they are looking for, identify the software titles by looking at software databases, and read reviews written by others. The evaluators then decide how the software is going to be relevant to their context, make recommendations of titles for selection. After the software is used by students, the evaluators track the students’ performance and rate the software features based on the criteria that the evaluators have developed. The evaluators are encouraged to create written records of recommendations of software to be used, where anecdotal experience from evaluators and students is collected for further analysis and improvement. Komoski and Plotnick do not intend to impose these guidelines, but rather suggest teachers adapt them. Komoski’s and Plotnick’s “responsible software evaluation” comes close to being an interpretivist evaluation because it includes multivocality (teacher and students, but not designers), contextualization, and interpretation

of the evaluator's (the teacher) experiences that incorporate anecdotal information of what happens while students are using the software.

Chapelle (1998) argues against use of simple checklists stating instead that CALL evaluation should be guided by SLA research. Further, Chapelle (2001) considers three important elements as principles of CALL evaluation. First, she insists that CALL evaluation criteria should be built on SLA research. Second, that a theory of CALL evaluation is necessary. Third, she proposes that multiple research methods should be used in CALL evaluation. Those methods are guided by the distinction between judgmental and empirical evaluation approaches where evaluation is a critical part of CALL design, and observation of learner's task use is critical. In addition, Chapelle states that the evaluation criteria and theory should be used to evaluate CALL materials, the activities that teachers design, and the activities that students engage in.

These more complex approaches to evaluation developed over time away from the simple checklist to one that includes the perspectives of developers, teachers, researchers and students, the context in which the materials are used, and the interpretations brought by those who design, use, and evaluate the CALL materials. This is particularly important to evaluate CALL for elementary classrooms where CALL must fit the needs of young learners, be child-centric, and enhance foreign language learning.

Summary Emphasizing the Value of an Interpretivist Approach

For over twenty years, authors have proposed software evaluation guidelines that typically considered just one element of the interpretivist evaluation (multivocality, contextualization, or interpretation). These elements were considered independently. Generally, those guidelines reflect either the teacher or the developer perspective. Even though authors deem what students are doing with the CALL materials to be an important part in the evaluation guidelines, this review demonstrates that their approaches lack of multivocality, contextualization, and interpretation coherent with foreign language learning in the elementary classroom. When authors consider the teacher's perspective, the evaluation guidelines do not go beyond a descriptive approach. Judgments with an interpretation are lacking. If teachers are to assume the role of a developer as Curtain and

Shinall (1987) suggest, they may consider an evaluation model that examines the design and development aspects of CALL not only from the instructional design perspective, but also in combination with learning and teaching theories of SLA and FL teaching perspectives.

Authors who have provided CALL evaluation guidelines for teachers may assume that teachers would use them, although typically, those guidelines do not elaborate on the ideas or hypotheses that teachers may have and want to test when working with CALL, nor do they consider criteria for the context in which the software is used. The multivocality, or the interpretation of teachers' and students' experiences with CALL is often missing. Postpositivist guidelines do not consider the experiences of teachers and students as a departing point. Those guidelines disregard the diversity of tasks in CALL, as well as the prior knowledge of teachers and students.

A few authors have considered a multiple view of evaluation from the combined perspective of either designer, teacher, or student (Chapelle, 2001; Hamburguer, 1990; Hubbard, 1987 & 1988; Laurillard, 1991; Pederson, 1987), but their work may not fully address two important interpretivist elements, namely the adaptability to local contexts or contextualization and the interpretation of teacher and student experiences with CALL.

The evolution of the guidelines shows the introduction of new themes into the discussion of software evaluation. A main focus of more generic software evaluation research in the 1980's was the study of effectiveness of Computer-Assisted Instruction (CAI) in learning outcomes, delivering content, and instruction (Kulik & Kulik, 1991). This present review shows other themes that are complementary to CALL evaluation such as adaptability and use of general software evaluation guidelines to the specific context of language learning, teacher education, searchable databases for language laboratory use and management of resources, blending of ideas from several disciplines for the design of CALL resources including SLA, language learning theories, and instructional design and development, and publication and dissemination of findings among the FL teaching profession. In addition, this literature review illustrates how the published guidelines were valuable in framing the components of CALL evaluation. These guidelines guided evaluations that have been published in the professional literature for the last 20 years. However, as new paradigms for research on CALL are suggested (Chapelle, 1997, 2001),

these guidelines can be improved so that they provide an interpretivist view of the CALL selection and evaluation processes. Thus, more flexible, open-ended ways to conduct CALL evaluations for selection are needed, and more importantly, ways that are based on discovery of selection criteria and reflections on the particular needs and contexts that help teachers make choices of CALL materials.

This analysis of the literature on evaluation of CALL resources is located at a time where foreign language educators are beginning to take an interpretivist approach to foreign language teaching (Kohonen, 2001; Reagan, 1999). An interpretivist approach to CALL evaluation would combine issues of instructional design and second language learning theory, FL teaching methods, and classroom-based practice with teachers' dialogue and reflection. The shortcomings of previously published guidelines and the use of checklists as an instrument for CALL evaluation illustrate the need for teacher training in CALL evaluation. The reviewed literature also explains how FL teachers may be assisted to make more informed CALL design and selection decisions by trying alternative evaluation strategies and seeing if those approaches give better results than strategies such as checklists (McDougall & Squires, 1995; 1997).

A brief illustration is provided of the development and evaluation of a CALL activity for elementary first and second grade classrooms. The designers were high school teachers who adapted and used Dodge's (1995) WebQuest template to develop the Cinderella WebQuest. These teachers had experience in Web design and knowledge of computer integration across the curriculum. These teachers as designers evaluated the activities, and infused K-2 specific content (addition concepts) with reading and writing of fairy tales. An ESL teacher in elementary school considered the Math standards (National Council of Teachers of Mathematics, 2000), the ESL standards (Teaching English to Speakers of Other Languages, 2000), and the student technology standards (International Society for Technology in Education, 2000) and the potential of the Cinderella WebQuest for use in her multiage multicultural classroom context. The ESL teacher adapted the Cinderella WebQuest materials to teach Math and English to young ESL learners in first and second grade. In evaluating the activities, the ESL teacher was guided by the Chapelle's 2001 judgemental evaluation criteria for teacher-developed CALL activities. The outcome of this

evaluation was to adopt and adopt the WebQuest for the specific language learning context of ESL elementary school. The ESL teacher used the activity in her classroom and her students reported their enjoyment, attitudes, relevance of the activity through a self-assessment instrument.

An empirical evaluation was conducted in the classroom and data were collected from student's task performances and individual classroom presentations as evidence of student language learning through negotiation of meaning, and problem solving. Finally, a Website was developed to share the experience, and provide instructions for teachers and students who would be interested in using the WebQuest. A more fully developed process of CALL evaluation from an interpretivist perspective is found in García Villada (2006, in preparation) and a description of a program where elementary teachers, developed CALL projects for teaching Spanish in elementary schools is provided by Rosenbusch, García Villada, and Padgitt (2003a, 2003b).

Proposed multivocality

The idea of bringing the perspectives of those who interact with the CALL resources into the evaluation is supported in recent formulations of foreign language education paradigms that propose interpretivist methodologies to foreign language teaching and learning (Kohonen, 2001; Reagan, 1999). Traditionally, second language acquisition experts, language laboratory personnel, multimedia developers, and media specialists have been responsible for the task of selecting and evaluating CALL resources, and their perspectives in CALL assessment speak with a monolithic, "expert" voice. The limitations of this sort of postpositivist approach to software evaluation, inherent in checklists and other technical classification paradigms (Squires & McDougall, 1996), are linked to the fact that the view of general software evaluation is changing.

For example, Squires and McDougall (1994) proposed a multiple "perspectives interaction paradigm" (PIP) that includes the diverse voices of the main actors in software assessment (i.e., designer, teacher, and student). The PIP is intended for general software evaluation, but it shows promise for CALL evaluation. Evaluations using the PIP approach

are an important alternative to the conventional postpositivist approach. As stated by the authors,

“The Perspectives Interactions Paradigm provides a comprehensive framework for thinking about educational software, and moves away from the (predominantly technical) attributes of educational software packages, and toward more educational issues, such as learning processes, classroom activities, teacher roles, curriculum issues, and student responsibility for learning. This is achieved by generating considerations associated with the interactions between pairs of the perspectives of the teacher, the student(s) and the designer” (Squires & McDougall, 1996; p. 155).

The interactions put forward by Squires & McDougall (1996) are one-on-one interactions between teacher and student, teacher and designer, and designer and student. One modification of the PIP evaluation would be to add a three-way conversation, instead of a two-way dialog, among the multiple actors that play a role in the evaluation. In addition, local, school, district, and national level voices could also be included, as Guskey (2002) has described his evaluation approach to teacher professional development. Critiquing not just the classroom context but the multilevel wider context (local, state, national) may lead to a multilevel approach to professional development for CALL evaluation. As Curtain and Shinall (1987) pointed out, teachers often assume the tasks of developing and teaching with CALL materials. Thus, FL teachers require training that includes development of expertise in content, learning theory, and CALL design. Training should also prepare FL teachers to judge, try out the materials, and conduct empirical CALL evaluations. For these reasons, Guskey’s (2002) suggestions for professional development evaluation may be useful for FL teacher development.

The need for a bridge between research and practice in CALL evaluation issues has also been identified in this literature review. Foreign language teachers would benefit from collaborating and dialoguing on issues of CALL design and evaluation, and educational technology research theory. The perspectives of designers, who may be interested primarily in technical issues or aesthetics, rather than pedagogical issues and real classroom teaching, are also important. The perspectives of evaluators testing the effectiveness of the material, as well as getting student perspectives, are equally important. Therefore, the need for an interpretivist evaluation method that brings in all these multiple and equally valid

perspectives, where the opinions of designers, teachers, and students are juxtaposed, is clearly seen.

Proposed contextualization

Contextualization is considered by Chapelle (1998), Squires and McDougall's (1994) PIP model, Pederson (1987), and Kowoski & Plotnick (1995). However, most of the literature does not focus on the K-6 context, and specific guidelines for FLES and CALL have not been documented in the literature (Nutta, Feyton, Norwood, Meros, Yoshii, & Ducker, 2002; Zhao, 2003).

CALL evaluation guidelines do not tell much about K-6 teachers' frameworks, or their own perspectives on using CALL in their classrooms. Contextualization emphasizes that the focus of the evaluation is not on the instructional material itself, but on its potential use within the context for which it is intended. In this sense, CALL evaluation depends more on the activities developed by teachers, and on what students do with the activity, than on the resource itself. Teachers plan, review, and use materials and activities suitable for their particular situations and students. CALL material that fits well with one teacher's specific situation may not be useful for other teachers even in the same school. In the FL at the elementary school context, evaluators need to specify what type of FLES program, what type of school, what is the setting in which the CALL resources are used.

In an interpretivist framework, teachers could benefit from developing their own CALL materials. This would help teachers become familiar with options in authoring systems, and built-in features of the software and its limitations, as stated by O'Neal and Fairweather (1984); Sussex (1991); and Wildner (2000). In addition, students often react favorably to the use of CALL materials that are developed by their own teachers (Pederson, 1987; Kreutzer & Neunzig, 1997).

A focus on context cannot originate from outside "experts." Teachers themselves are in the best position to provide the insider's story about the benefits of CALL in their classrooms, and that can be shared with the designers, researchers, and teachers. However, teachers are busy, and lack of time in their already busy schedules makes it difficult to participate in classroom-based research and CALL design and evaluation.

Proposed interpretation

This third element of interpretivist evaluation comes from the tradition of hermeneutics. As pointed out in this review, interpretation is frequently overlooked by those who have proposed CALL evaluation guidelines. In his work on educational evaluation, Eisner (1976) referred to interpretation as a component of his “connoisseurship” model. According to Eisner, evaluators should possess “refined taste” and be sensitive to educational phenomena. Eisner’s model proposes that in order to carry out an educational evaluation, the evaluator would need to critique, interpret, and evaluate the phenomena under investigation.

Similarly, in his discussion about the paradigm debate in educational research, Gage (1989) envisioned an interpretivist approach where teachers become actively involved in research on teaching, generate their own findings, reflect deeply on their observations, and share their ideas with other teachers. It follows then that an important component of the interpretivist evaluation is that teachers keep reflective journals of the evaluation results as a way of documenting their opinions and experiences. If evaluators submit their interpretations as narratives, they would tell the story of how CALL was used, the considerations given to pedagogy, and the way the lesson was taught. They could also address questions such as, was the CALL material used effectively? What were the students’ experiences? Are students learning?, and if so, what outcomes were observed? What acceptable evidence of CALL use do they demonstrate? Did students interact with each other during the CALL activity? What were the teachers’ impressions and observations about the use of CALL with his/her students?

An interpretivist framework suggests the telling of the story, relating what happens in context, and incorporating student and teacher voices in the descriptions of CALL use at the elementary school. However, narrations, critiques, and reflections on classroom experiences are not addressed in guidelines for evaluating CALL. One possible explanation is that they are part of a qualitative approach to inquiry that has not been the tradition in CALL evaluation. The postpositivist empirical tradition has emphasized “objectivity” as opposed to subjectivity, and the voices of “experts” as opposed to the voices and reflections of practitioner teachers.

Overview of the proposed framework

The discussion above offers a basis for three elements of an evaluation frame for CALL specifically appropriate for elementary education. The three elements are multivocality, contextualization, and interpretation. It is apparent that the multiple voices from the authors who design, use, and evaluate CALL resources, the support required from teachers to develop and evaluate CALL, and the context in which those materials and activities are used are essential elements of an interpretivist CALL evaluation. In addition, an interpretation that involves the telling of the story of the use of CALL in the classroom including teachers' and students' perspectives constitutes a fundamental element of the framework.

Conclusion

Over time the evaluation of CALL materials has developed to reflect the complexity of the FL classroom, into which evaluation and the use of CALL must be integrated. The literature shows that single-sided approaches were commonly used in the evaluation of CALL materials for foreign language education, especially in the earlier literature. These approaches have resulted in evaluations that focus on the effectiveness of CALL for learning, and promote the use of checklists that lead to generalizations that are not always applicable to specific contexts. An interpretivist approach provides guidance to developers and teachers who are interested in developing, evaluating, or using CALL.

This paper has analyzed the literature and presented a multi-vocal, contextual, and interpretive framework for future CALL evaluation. A review of the professional literature in the field of CALL evaluation revealed that examples of interpretivist evaluations are lacking. Interpretivism emphasizes issues such as biases in evaluation, classroom-based research, familiarization with research on CALL evaluation, awareness of the limitations of single-sided approaches, and formulation of teacher-developed evaluation criteria.

An interpretivist CALL evaluation is a conversation among the multiple actors that play a role in the evaluation process. The perspective of the FL teachers would enrich the CALL design and evaluation process by providing the classroom view that is relevant to SLA researchers, teacher educators, and CALL designers. The perspectives of designers

would expand from including technical issues of design and aesthetics to pedagogical aspects of real classroom contexts. The perspectives of evaluators testing the effectiveness of CALL materials and that of the students are equally. In an interpretivist CALL evaluation, teachers are in the best position to share their own stories about the benefits of CALL for their students. Teachers plan, review, and use materials and activities suitable for their particular situations and students. The focus of an interpretivist evaluation is not simply on the CALL resource itself, but on the potential use of the CALL material within the context for which it is intended. Interpretivist CALL evaluation depends more on the activities developed by teachers, and on what students do with the activity, than on the resource itself. A final component of an interpretivist framework proposes that teachers critique, interpret, and evaluate their experiences with CALL materials. Such an approach would also involve teachers doing research on teaching, plus generate their own findings, reflect deeply on their observations, and share their ideas with other teachers.

As we have seen, the goal is that the use of this integrated approach in foreign language teacher development would facilitate the inclusion of teachers' and students' perspectives and experiences working with CALL into the current educational research on CALL evaluation, and strengthen teacher education programs. This approach would also strengthen the connection between research and practice in FL education. Further research is required to turn these recommendations into an approach that can be used in K-6 FL teacher's education.

Acknowledgments

I am grateful to many persons who provided information, critiques, and support during the writing of earlier drafts of this paper. Special thanks to Professors Helen Ewald and Jerry Willis. I wish to express my sincere appreciation to Professors Carol Chapelle, Niki Davis, Marcia Rosenbusch, Ann Thompson, and Donna Merkley. I am grateful to you and the anonymous reviewers of my work who helped me better capture the elements of an interpretivist CALL evaluation framework for foreign languages in the elementary school.

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EXPERTS' VIEWS OF NOVICE K-6 LANGUAGE TEACHERS' EFFORTS IN TECHNOLOGY INTEGRATION ACROSS THE CURRICULUM

A paper to be submitted to
Foreign Language Annals
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Abstract

Foreign language teacher educators agree there is need for guidance in applying appropriate strategies to teach foreign languages to children using computer-assisted language learning (CALL) as a complementary approach to classroom teaching (Cunningham & Redmond, 2002; Oxford, 1998). There are few examples in the literature, however, that document the infusion of technology into teachers' training for the K-6 foreign language classroom. This study portrays a phenomenological investigation of K-6 teachers' CALL projects that resulted from a teachers' professional development program on CALL integration with Spanish and content from other subject areas. The CALL projects were analyzed by an expert team of teachers and teacher educators, and the components of an interpretivist CALL evaluation framework were used to judge the projects. Teachers' voices were interpreted as expressed in the documents and in the artifacts submitted to demonstrate the completion of their projects. A total of 106 teachers in 14 schools developed 64 CALL thematic projects individually and in groups, but few had strong potential for teaching Spanish language and culture, and most were teacher-centered rather than student-centered. It is recommended that more attention is paid to the complex realities and contexts of language interactions by teachers and students in the K-6 classrooms. This study supports the view that the most appropriate perspective for CALL evaluation is an interpretivist view with multiple voices including teachers and students, who adapt, evaluate and use CALL.

Introduction

There are numerous research studies documenting the effectiveness of use and integration of technology into the curriculum of many subject areas, except the K-6 foreign language classroom (Kulik & Kulik, 1991; Liu, Moore, Graham, & Lee, 2003; Nutta,

Feyton, Norwood, Meros, Yoshii, & Ducker, 2002; Zhao, 2003). One explanation for this may be that foreign language has not been considered a core curricular area in K-6 classrooms in the United States in the same way that science, math, and English language arts are considered core, although its status has improved recently. In addition, the typical model of teaching foreign language at the elementary school (FLES) includes little contact time for student exposure with the target language, and teaching by a teacher who travels from building to building. These kinds of restrictions frequently inhibit foreign language teachers' use of technology in the classroom. There is also a lack of a research base in the area of computer-assisted language learning (CALL) for FLES, as most CALL research has focused on adult foreign language learners.

One solution to integrating technology in foreign language teaching examined in this project is to train regular classroom teachers in the foreign language and culture, in strategies for teaching language and culture, and in the use of technology. The IN-VISION project, a federal grant project supported by the U.S. Department of Education, aimed to train regular K-6 classroom teachers in methods of teaching a foreign language to children, integrate technology into Spanish language teaching, and teach Spanish language and Hispanic cultures to K-6 students. Classroom teachers participating in the project had no prior knowledge of Spanish. Thus, their role was to reinforce the language and cultural instruction provided by Language Associates. Language Associates were all native speakers of Spanish. However, most of them were not trained elementary teachers, but had experience working in elementary schools. The Language Associates taught Spanish for 20 to 30 minutes per week throughout the school year. Classroom teachers integrated this instruction into their own teaching of other disciplines, with the support of supplemental materials, extensive training in foreign language teaching strategies, and methods that included the viewing of a Spanish video series once or twice a week. IN-VISION project staff, who were professional development trainers in technology and Spanish, trained the classroom teachers and Language Associates (Trayer, 2001; Trayer & Knoche, 2002; Rosenbusch, Garcia Villada, & Padgitt, 2003).

Teachers participating in the project learned how to use software and hardware such as PowerPoint, KidPix, Webpage Maker, ScanIt software, WebCam, and digital cameras to

develop integrated thematic projects to teach Spanish to children. “Thematic Teaching” (Kovalik & Olsen, 1994) is a technique used as an organizing principle in curriculum development for elementary schools. Integrative curriculum is also a way of organizing learning that aims to develop lifelong learning skills of children in real-world situations with a combination of subject-content areas and an emphasis on student projects (Beane, 1997). In the elementary foreign language classroom, integrated thematic teaching can strengthen both the foreign language and other elementary classroom subjects with the use of a theme-based approach to teaching and learning, and has the potential to become an effective teaching innovation (Curtain & Dahlberg, 2004; Haas, 2000).

This paper examines the technology-rich integrated thematic projects developed for teaching Spanish to children by teachers participating in the IN-VISION project. A team of practicing elementary school foreign language teachers and teacher educators from across the country was recruited to evaluate the thematic projects. An interpretivist framework (García Villada, 2006 in preparation) was used in this study to develop a questionnaire for the experts’ team and for the evaluation criteria. The framework also assisted in checking the inclusion of such parameters as teachers’ use of contextualization, multivocality, and interpretation in the design of their CALL thematic materials.

The following section explains briefly the theoretical underpinnings of the proposed CALL evaluation framework, followed by a description on the context, the methodology, and the procedures used to conduct the study. Subsequently, the results are presented and analyzed.

Theoretical Framework

The perspectives associated with the interpretivist paradigm in social science research are useful to understand the complexity of the evaluation of the design and development and implementation of CALL materials. A variety of assumptions about the relationship between research and practice underline the variations in social science research paradigms (Guba, 1990). In turn, these research paradigms influence the assumptions and generate opposing views of technology in education. For example, Hlynka and Chinien (1990) assert that, “[t]he field of educational technology is characterized as being dominated

by a paradigm split” (p. 71). These paradigmatic positions were studied by Levy (1997) as they pertained to the field of CALL. Levy maintains that two prevalent frameworks characterize CALL design and development. The first strand of developers (formalists) relies on intuition rather than research on learning. These developers are interested in formulating a theory of CALL. The second strand (proceduralists) is guided by cognitive psychology and SLA theories. These developers prefer solving design and development problems by writing CALL programs. Both of these positions are considered important in this study because of the expressed need to expand the theoretical basis of CALL for FLES, and because FLES teachers are now expected to integrate technology in meaningful ways into the FLES curricula.

More recently, Willis, Jost, and Nilakanta (2002) provided an analysis from a historical perspective of the philosophical foundations of research on instructional design and technology (IDT). Some of the foundational issues in IDT refer to development and evaluation of technology-enhanced materials for learning. The authors state that an interpretivist paradigm can be used to conduct evaluative research on the design and development of technology-enhanced instructional materials. According to Willis et al. (2002), the spirit of interpretivist IDT may be captured by three elements. The first element is *multivocality*, which involves the use of multiple actors and their views on the topics of educational research and practice. The second element is *contextualization*, which calls attention to local and authentic realities of the educational setting. The third element is *interpretation*, which allows the construction of meaning through the interpretation and the reflections of the researcher and the practitioner. An interpretivist framework for CALL (García Villada, 2006a in preparation) that focuses on *multivocality*, *contextualization*, and *interpretation* provides support for the evaluation of the technology-rich integrated thematic projects in this study.

Context of the Study

IN-VISION, a Technology Innovation Challenge Grant funded by the U.S. Department of Education, was a five-year project whose purpose was to provide Spanish language instruction to elementary school children with the aid of technology-enhanced

materials in two Midwestern states of the U.S. Classroom teachers, with minimal experience using technology and no proficiency in the Spanish language, received training in the integration of technology into classroom activities, in the Spanish language, and in Spanish language teaching strategies for children. These teachers also received ongoing on-site support and training in the use of technology and the integration of the Spanish language into other school subject areas. All participating schools were similar in terms of the resources, the training given to teachers, and the student communities. During 1999-2000, the year when the projects analyzed in this study were developed, a total of 14 elementary schools in Iowa and Nebraska participated in the IN-VISION Project, comprising 2,081 K-6 grade students and 150 K-6 teachers.

The National K-12 Foreign Language Resource Center and the Research Institute for Studies in Education in the College of Education at Iowa State University (ISU) collaborated in evaluating the IN-VISION project. Although IN-VISION was evaluated annually as a requisite from the granting agency (Rosenbusch, Padgitt, & Garcia, 2002), the CALL projects were not the focus of those evaluations. This study focuses on the evaluation of these technology-rich integrated thematic projects as examples of CALL materials. The projects were evaluated using the interpretivist framework described earlier (García Villada, 2006a in preparation).

Teachers' Technology Training

As can be seen in Table 1, one of the goals of the IN-VISION project was to implement a professional development model for classroom teachers who had limited previous experience learning Spanish. Another goal of the IN-VISION project was that teams of elementary school teachers would create interdisciplinary thematic projects supported by technology to reinforce the Spanish lessons taught by Language Associates. IN-VISION provided training opportunities for these teachers in Spanish-language communicative competency, understanding of Hispanic cultures, and the integration of technology into the school curricula. Elementary school classroom teachers were expected to: (1) attend year-long (summer, fall, and spring) staff development sessions for which university credit and salary incentives were offered, (2) practice basic second language

acquisition teaching methodologies and effective means of implementing the foreign language student standards (Bruning, Flowerday, & Trayer, 1999), and (3) examine ways of integrating content of other subjects into the integrated Spanish activities.

Table 1. IN-VISION Project: Technology Goals Analysis

Goals	Indicators	Measure
Intermediate Outcomes		
<i>Improve ongoing mentoring and support for teachers in technology.</i> Has the staff development program changed the way teachers teach or integrate technology into their content?	Teachers will receive technology training through workshops and on-site support.	Teachers' Prior Knowledge Inventory ¹ Teachers' Professional Development Program Evaluation ¹
<i>Improve technology-enhanced curriculum integration to heighten student learning.</i> Does teacher's competency in technology enhance student learning? Have teams of teachers (including elementary, secondary, and Spanish teachers) created interdisciplinary thematic projects supported by technology?	Teachers will improve their ability to integrate curriculum content through the use of technology-enhanced activities.	Formative Evaluations of On-going Teachers' Professional Development ² Integrated Thematic Projects ¹
Long-term Outcomes		
<i>Increased computer literacy for students and teachers.</i> Have teachers and students used technology in distance communication, accessed information through the Internet, used multimedia presentation tools, and demonstrated knowledge of general computer/technology use?	Teachers and students will demonstrate an ability to comfortably use different technologies.	Teachers' Technology Survey ¹ Summative Evaluation of Project ¹ Expert Evaluations of Integrated Thematic Projects ³

¹ Evaluation by IN-VISION Project Evaluation Team.

² Evaluation by IN-VISION Project Staff.

³ Not part of the original evaluation plan, but added later and evaluated by National Expert Team.

The IN-VISION project provided K-6 teachers extensive professional development in technology, as well as hardware and software to facilitate the integration of these activities into the curriculum. In addition, a bi-weekly professional development program was conducted via the Iowa Communication Network or the Nebraska distance education network. From a remote site, the trainers delivered instruction and communicated with

teachers in the project at several remote sites simultaneously, using video conference technologies.

Table 1 reviews the IN-VISION technology goals using questions adapted from the evaluation guide prepared by Quiñones, Kirshstein, and Loy (1998) for the U.S. Department of Education Office of Educational Research and Improvement.

During the second year of professional development (1999-2000), the project director asked teachers to prepare a thematic plan to integrate technology into their classrooms (Trayer, 2001). They were asked by the project staff to provide an updated progress report at the mid-point of the school year, and to submit the finished projects as evidence of completion and implementation.

Methods

A descriptive phenomenological methodology is used as the general research method in this study (Gall, Borg, & Gall, 1996). The emphasis of this methodology is on analyzing the phenomena of technology integration into foreign language teaching in elementary classrooms. Teachers' experiences were interpreted as expressed in the documents used to plan and develop their projects, and in the artifacts submitted to demonstrate the completion of their projects. This descriptive methodology also aims to understand and interpret the intentions, the quality, and the potential for teaching and learning in the teachers' projects. Two methods were used to conduct the study, namely document analysis and guided interviews of experts in CALL and elementary education.

The curriculum integration projects and thematic teaching for K-6 grades were evaluated by a group of experts that included practicing elementary school Spanish teachers and university professors of language education and technology. In the assessment procedure, the experts who evaluated the projects defined (1) the typical quality level of these projects and the range of quality; (2) the common strengths and weaknesses of these projects; (3) the types of learning strategies and technologies used and their appropriateness to the teaching of language and culture, and (4) the relative merits of the strategies and technologies, as compared to the "optimal."

Data collection

A sample of 10 representative projects was selected from a total of 64 technology-rich integrated thematic projects that were developed by IN-VISION teachers who participated in the staff development sessions. These 64 units and their accompanying teaching materials were submitted to the evaluation team. The evaluation team prepared a report that described the collection of units and materials and verified that the project's professional development goal had been met (Rosenbusch, Padgitt, & Garcia, 2002). Thirty-two (50%) of the projects incorporated Spanish and other content areas. The project themes included a variety of topics from the sciences and humanities, such as monarch butterfly migration, rainforests, biodiversity, explorers of the Americas, Mexican culture, and Ellis Island immigration.

A total of 64 final projects were submitted from all 14 participating IN-VISION schools (Table 2). Twenty-eight teachers submitted individual projects; in addition, a total of 36 teams, each composed of a minimum of two to a maximum of seven teachers, submitted collaborative projects. The average number of projects per school was 5, with a minimum of 1 project in three of the schools and a maximum of 14 projects submitted by one school. As Table 2 indicates, the grade levels for these projects range from Kindergarten to 12th grade, with 26 projects submitted for grades K-3, 15 projects for grades 4-6, 2 projects for 7-12th grades, and 21 projects that did not have a specified grade level. The 41 projects targeting K-3 and 4-6 grades were analyzed as the main focus of this paper (Table 2) because the purpose of this study is on CALL for FLES.

Table 2. Number of Projects Submitted by Grade Level

Grade	K-3 rd	4 th -6 th	7 th -12 th	Not specified	Total Projects
Number of projects	26	15	2	21	64

Some individual teachers and teams included with their thematic projects additional materials in print, videotape, CD-ROM, and floppy disk formats, providing evidence that their thematic project was implemented in the classroom. These materials included copies of students' class work, drawings, pictures, graphs, letters, and PowerPoint slides, and they were analyzed and evaluated for this study.

Data reporting procedures

As a method of documenting the development process of the thematic projects, IN-VISION teachers were asked to complete forms developed by the project staff. There were three forms for projects intended for K-3 grades, and one form for projects intended for 4-6 grades. A description of these forms follows:

1. The project planner form (see Appendix A) included a space for teachers or team of teachers to indicate the topics they planned to address in their project (i.e., student objectives, expected outcomes, and required skills and resources). Teachers or teacher teams also indicated the instructional strategies they planned to use when integrating these projects into their classroom instruction. Table 3 lists the type of strategy and the number of projects using each strategy for the 26 grade K-3 projects. Because some projects used multiple strategies, the sum of these frequencies is not equal to the total number of projects.

Table 3. Instructional Strategies Planned for Use by K-3 Grade Projects

Strategy	n	Strategy	n	Strategy	n
Class discussions	4	Small group instruction	3	Mini lessons	1
Modeling	4	Sorting	2	Time management	1
TV/Video watching	4	Matching	2	Key-pals	1
Internet use	4	Classifying	2	Cooperative learning	1

2. The project update form (see Appendix B) asked teachers or teacher teams to reflect on the revisions, if any, to the original plan, and the activities they had undertaken to complete their plan. There were 9 projects out of 26 K-3 projects that were revised: 4 projects changed themes, and 5 changed the software used in the project. The project update form also asked teachers if they needed any support to help them complete their thematic projects successfully. The most frequent response teachers made was to ask for more time to complete the project. The explanations for the need for more time were either because the projects took more time than expected (8) or because there were delays in the installation of hardware and/or software in their schools (3). In addition, some teams wanted to become more familiar with the software they were using (2). Only one group requested more computer training.

3. The final project form (see Appendix C) asked teachers to report how they would describe the success of the project and what concepts students learned from completing the project. The final project form also asked teachers to rate on a Likert-type scale of 1 (little) to 5 (much) the extent to which learning was enhanced because of the use of technology in the project. With the mid-point of the scale being 3, ratings that are 3 and above attribute learning enhancement to the use of technology. Out of 11 teams that responded to this question, nine (82%) gave ratings of 3 and above. The mean score of 3.6 indicates that teachers believed technology did indeed enhance learning in these projects.

Every form (i.e., planner, update, and final) asked teachers or teacher teams what technology tools/skills they incorporated that were new to them and/or new to their students. Technologies used by the 64 projects and their frequencies are indicated in Table 4, and classified in four categories. The desktop computer technology used most frequently was websites (12). The computer software most frequently used was PowerPoint (6), while the electronic devices used more frequently were video/still digital camera (13), and the media storage devices most frequently used were Spanish CDs (4).

Table 4. Frequency of Technologies Used in Projects

Computer Technologies	n	Computer Software	n	Electronic Devices	n	Media Storage Devices	n
Websites	12	PowerPoint	6	Video/still digital cameras	13	Spanish CDs	4
Computers	4	Word processor	4	Camcorders	2	Videotapes	4
WebCam	1	Keyboarding software	2	TV	1	CD-ROM encyclopedias	3
Scanner	1	KidPix	2	VCR	1		
Printer	1	WebPage Maker	1	Radio	1		
e-mail	1	ScanIt	1	Microscope	1		

4. The “Idea Sheet” (see Appendix D) for WebQuests (grades 4-6) included information about the school, the teacher, the WebQuest title, a description of the WebQuest, the task, the resources, the process, a section on learning advice, and the conclusions. This format followed the guidelines proposed by Dodge (1995) for teacher completion of a WebQuest.

Selection of thematic projects

Spanish was stated explicitly as a subject in only 14 of the fully-documented projects. From these, the 10 projects (K-6) that were determined by the researcher who carried out this project to be the most integrative of curricula and technology-rich were selected for in-depth analysis by experts (see Appendix E). This researcher used a two-fold process for organizing the information from the 64 thematic projects. First, records for each teaching project were organized based on the information provided at each step of the units' development process. The information from the three forms submitted by teacher or teacher teams was entered into Excel spreadsheets to reflect each project's plans, update, and final report. Each project was identified by title and assigned a sequence number. After this, the second phase, or selection procedure, began with a review of the completeness of the information provided, the type of themes proposed, their intended grade levels, and the artifacts submitted.

For grades K through 3, teachers submitted 26 plans, 31 updates, and 20 final reports for thematic projects. For grades 4 through 6, teachers submitted 15 Idea Sheets for WebQuests. Of these K-3 and 4-6 projects, selection criteria for inclusion in this study were that projects had to be fully documented with all required planning forms, the projects had to focus on Spanish, and had to be technology-rich. In addition, for this specific study, the number of projects for experts to analyze had to be reasonable in terms of the time commitment needed to review them.

Materials for experts' review

A package with the ten projects was provided to each of the experts for their analysis. The package of materials was organized in a three-ring binder with separator sheets to identify each of the projects. Artifacts that were submitted in print, such as print-outs of Hyperstudio stacks, PowerPoint presentations, and WebQuests, were color duplicated when appropriate. The binder also included: (1) a two-page summary describing the entire collection of teacher-developed materials, (2) an article with a description of the IN-VISION project (Trayer, 2001), (3) a questionnaire for experts (described in the following section), and (4) teaching materials from each of the 10 projects, submitted as

evidence of the completion of the teachers' professional development provided by IN-VISION.

The summary gave an overall description of the number of thematic projects submitted, the grades targeted, the type of themes, and the strategies and technologies used to develop teachers' technology-integrated materials. Since no other information regarding the content of the professional development in technology was available, a detailed syllabus of that component could not be provided. According to Trayer and Knoche (2002), "Through the varied styles of professional development, the teachers gained skills in PowerPoint software, efficient Internet searching, video creation, scanner use, digital photography, and Web page design" (p. 16). Thus, the content of the professional development program was taken at face value, with an understanding that teachers received adequate training for developing their technology skills and their use of several technology tools to develop their thematic projects.

Overview of procedures used to review the thematic projects

The selection criteria for the ten projects analyzed in this study included the fullness of the documentation, the use of Spanish, and how well they focus on K-6 curriculum content. The organization and selection of materials were followed by the development of a questionnaire to guide the experts in their review of the evidence presented with the projects, followed by individual interviews in which a team of experts were asked to predict the intentions of the trainers and teachers, as well as to interpret the evidence submitted with each of the ten selected projects.

Questionnaire for experts

A 12-item questionnaire for experts was developed by this evaluator (see Appendix F), with the purpose of eliciting the experts' views on the ten selected projects, and was included with the package of materials that all experts received before the interviews. The document, titled "An Educator's Guide to Evaluating the Use of Technology in Schools and Classrooms" (Quiñones, Kirshstein, & Loy, 1998), was used to inform the development of this questionnaire. Chapelle's (2001) "judgmental evaluation" guidelines for computer-

assisted language learning materials also helped frame the content of the questionnaire. Of particular interest was Chapelle's category of "language learning potential" in the materials. This category was used in the questionnaire to prompt experts to determine whether the proposed activities hold potential to promote foreign language learning. In addition, an interpretivist framework for the evaluation of CALL materials for FLES (Garcia Villada, 2006a in preparation) informed the development of the questionnaire. Finally, two professors, one in teaching elementary foreign language education methods and the other in curriculum and instructional design, provided content validation for the questionnaire.

The questionnaire was divided into two sections. There were seven items in section one and five items in section two. Section one was completed by the experts prior to their interview with the researcher. The main focus of section one was for the experts to provide an overall assessment of the quality of the projects. This section was a guide for the experts to focus their thinking and, consequently, their overall assessment of the thematic projects, as well as to help form their evaluations of the teaching strategies used in the project, and the appropriateness of those strategies for children of the grade level designated by the projects. In sum, section one may be conceptualized as the "review of the evidence." The seven questions in section one relate to an appraisal of the quality of the project, the teacher's ability to adapt to changes needed in the development of the project, the appropriateness of the strategies used to teach Spanish to elementary school students, the strategies used by and the tasks required from these students, and the language and culture outcomes expressed by these students. Experts were asked to take notes as they reviewed each of the thematic projects, so the notes could be used to guide them in addressing the five questions in the second section of the questionnaire during the interview.

Section two of the questionnaire included five questions that were addressed during the researcher's interviews with the experts. This section was speculative, in that the experts were asked to imagine, and in some instances guess, the intentions of the trainers and the teachers developing and implementing the thematic projects.

Selection criteria for experts

The criteria for selecting the experts were their demonstrated experience in the use of technology, familiarity with elementary foreign language teaching methodologies, and experience in developing thematic projects for foreign language teaching in elementary schools. Also, consideration was given to the expert's ability to understand Spanish.

Procedures to obtain experts' participation

This evaluator invited foreign language teacher participants in the Summer Academy on Leadership and Change, sponsored by the Center for Teaching and Learning with Technology at Iowa State University in 2002, to collaborate in the evaluation of the projects for this study; two of the participants expressed interest in participating. This evaluator also consulted with the director of the National K-12 Foreign Language Resource Center at ISU, to obtain the names of potential experts who would meet the selection criteria. These experts were contacted by e-mail or phone and asked for their participation in evaluating the thematic projects. In addition to the two participants from the 2002 Summer Academy, five more experts agreed to participate.

During the spring of 2003, these seven experts were contacted and provided with a "consent agreement" form, which they were asked to sign and return. By signing the form, they agreed with the terms required by the Human Subjects Research Office at ISU, and agreed to participate as reviewers of the thematic projects. The experts also agreed to be interviewed as part of the review process and gave permission for the interviewer to audiotape the interviews. After this, each expert received the binder containing the materials for the review, and the materials were hand-delivered or sent by fax, e-mail attachment, or regular airmail. Subsequently, face-to-face interviews for those experts in the researcher's institution and telephone interviews for out-of-state experts were scheduled, allowing the experts at least two weeks to review the thematic projects. Since there was only one copy of the binder with the thematic projects for review, each interview needed to be scheduled after each expert had mailed or returned the binder to this evaluator. All seven interviews were conducted during the late spring and early summer of 2003.

Interview process with experts

Experts were asked to study the projects and write notes before the interview. At the beginning of the interview, the experts were asked if they had questions before proceeding, and then were informed that interviews would begin when the audio-tape was turned on. Experts were asked to state their professional background, institutional affiliation, and to articulate the perspective they brought to their assessment of the thematic projects. They were asked specifically to express what unique expertise they possessed that was useful in the evaluation of the projects. Since the main purpose of the interview was to address section two of the questionnaire and as a way of keeping the interview within 30 to 60 minutes' duration, each expert was asked to summarize his/her experience with the appraisal of the projects. Specifically, they were asked to answer what was their overall impression of the projects as a whole. After this, the five questions contained in section two of the questionnaire were addressed. At the end of the interview, the experts were asked to give or send to the researcher a copy of the notes that he/she had written while reviewing the thematic projects. The notes became part of the data for the interview analysis.

The interviews were transcribed verbatim. The interview transcripts and notes written by experts about the thematic projects were examined for emerging patterns and themes. NVivo software was used for the qualitative analysis of the data, using a grounded theory/constant comparative approach (Bogdan & Biklen, 1992) as the research design for analysis and interpretation of multidata sources.

Results

The themes that emerged from the analysis of the experts' data are organized below in two sections. Section One contains answers to questions 1 and 2 that were provided to the experts prior to the interview, and Section Two contains answers to questions 1 through 5 that were asked during the interview. The themes are presented here first by question, followed by discussion. In the quotations included to illustrate the themes, appropriate designations (i.e., E1 through E7) represent the different voices for each expert.

Section One

As noted in the description of the questionnaire for experts, questions in Section One were a guide for the experts to focus their thinking and, consequently, their overall assessments of the technology integration projects. Experts were asked to study the projects and make notes for each project based on these questions. Five of the seven experts made notes and shared them with the researcher after the interview ended. At the beginning of the interview, experts were asked to summarize their experience during the review of the projects. Their summaries and notes were recorded and analyzed. Only questions 1 and 2 of Section One were addressed directly during the interview.

Quality of the projects

Question # 1: *What is your impression about the quality of each of these thematic projects?*

In terms of quality of the thematic projects, the experts noted the following patterns: The projects' quality varied by project and by school. The context in which Spanish is taught contributed to the variation in quality. Some projects focused only on subject content and did not use Spanish at all; others used Spanish at a level that was judged too high for the children's probable level of proficiency. This variation also was due to an excessive number of goals for teachers and students, and the modest level attained by these teachers in their technology and language skills. Thus, many of the projects took more time to complete or did not meet all goals that project staff appears to have emphasized. However, most experts agreed that some of these thematic projects were engaging and interesting, and provided students the possibility of developing an interest in learning Spanish. A representative quote from one expert follows:

I was really interested. It looks like the kids have a good time making these things; they look like fun. I assume that fun is good, and I would assume that one of the primary aims of FL teaching at this age would be just to get the kids interested, and get them so that they would possibly consider continuing language study, and so that they would possibly be interested in someone who speaks another language as opposed to [be] afraid of, or not want to talk to someone who speaks another

language. So I think some of the more kind of effective, or kind of engagement possibilities with these projects is probably one of the most important things, ... it looks like from just looking at what was produced ...[that] the kids took them seriously and they had a good time with them, and so in that sense [the projects were] very positive. [E1]

Strengths of the projects

Question # 2: *What are the strengths and weaknesses of each of these thematic projects?*

One of the projects involved the community, and it received the most number of positive comments from experts. This project also was praised for being truly “thematic.” Projects with a cultural component received positive comments as well. In general, projects deemed to be strong are projects that (1) involve the community, (2) have students creating something with technology, (3) integrate different content areas, (4) have themes with potential for standards-based teaching, and (5) are on-going for the duration of the school year. A representative quote from one of the experts clarifies:

[T]here was one lesson that intrigued me. They did it with the community.... [T]hey did things throughout the school building and throughout the community, to kind of connect, [to] let parents know: “this is important to your children, but yes, it is also important to you in the community.” You know [they were], putting articles in the [news]paper, and those kinds of things, so that to me was kind of a next step rather than just teaching kids hello and good-bye in Spanish, and I thought it was a nice touch. [E3]

Weaknesses of the projects

The experts’ comments on the weaknesses of these projects can be summarized as follows: (1) lack of Spanish language and culture integration with other curriculum areas, (2) lack of definition of what was the teacher’s or the student’s involvement in projects and activities, and (3) unclear definition of what students were learning as a result of

participating in or completing the activities. A representative comment from one of the experts on this topic includes:

These projects are very rote stuff and disconnected from culture, which is a typical problem for me, and again that may be something that is an issue with elementary level teaching. You can't really do other than memorizing some food and some holidays. You are sort of limited in how far up the ladder you can go in terms of cultural objectives And from a standards' perspective, from a foreign language teaching perspective, you know all the content, the content enriched stuff, the culture stuff, and the language teaching communication stuff, it should be really well integrated and there should be a really good flow between all three of those areas. They are actually in communication with one another. That to me means integration. Just having a little, you know, sprinkle of this a sprinkle of that; that is not integrated. [E5]

Section Two

This section includes themes that emerged from the analysis of the responses given to questions 1 through 5.

Effectiveness of technology training

Question # 1: *From these projects, what might you assume about the effectiveness of the teachers' training in technology?*

Experts agree that the technology training was effective in that it facilitated teachers' use of technology as well as teachers' development of basic technology skills. However, judging by the contents and quality of the thematic projects developed by these teachers, teachers demonstrated a "novice level" of technology proficiency. A representative comment from one expert illustrates this theme:

They used tons of technology, so the effectiveness of the teachers' training ... was highly effective because they must have been exposed to quite ... a lot of technologies

and a lot of different things ... they could use in their own classrooms. Because they were using scanners, there were tapes, CDs, specific Spanish CDs that they have learned about, email, Encyclopedia CDs, HyperStudio, PowerPoint, WebQuest, creating a WebPage, so just by the variety that I saw in terms of technology integration obviously that training had to be fairly effective. [E3]

Technology training seemed to be aimed at developing teachers' basic technology skills in a limited number of software applications, and teachers were still mastering these skills. However, it was not clear how the training was accomplished. By looking at the evidence provided with the thematic projects, the experts agreed there was a lack of: (1) authenticity in the materials used in the thematic projects, (2) guidance given to teachers, (3) a clear definition of the expectations for the projects, and (4) consideration for students' use of technology. In addition, training was deficient in matching the tasks required from students and the strategies used by the teachers in choosing tool software for the thematic projects. A representative comment illustrates these topics:

There is no evidence of guidance. They could just do a project of anything they wanted and so it's so broad that some of them apparently are not involving the students I'd say the one thing that I think was probably not included in their training was how to use technology with students, because they didn't really show, to me, good evidence that they understood deeply how to use it with students. [E4]

Experts agree that it was unrealistic in the training to expect novice technology users to integrate technology on their own with Spanish and content from other curricular areas. It takes time to master basic technology skills, and even more time to integrate technology into teaching. Experts expect that in another round, when these teachers feel more comfortable with technology, they will address the issue of how students make use of technology. The following comment illustrates this topic:

I got the feeling that the teachers were using the technology more than the students, but I think that is very natural, I think that ... if you keep working with these teachers what you have to start seeing is, 'OK, you have kind of mastered the technology now, what can you do in your classroom that allows the students to use the technology?' There was an example back here that they were using HyperStudio and ..., it looked like the kids were making the stacks. [E3]

Effectiveness of teachers' strategies

Question # 2: *From these projects, what might you assume about the effectiveness of the teachers' strategies and ability to change and adapt the thematic project to the learners' needs?*

There seems to be a split in the experts' opinions on the question of teachers' abilities to change and adapt their projects to their learners' needs. Some experts said that teachers effectively changed and used strategies to adapt instruction to the children's level. They also said that teachers modeled technology use for their students and that teachers assisted students and looked for help when needed. The following comment illustrates this position:

[T]he instructional strategies seemed very grade-appropriate, because these people obviously have experience teaching in elementary schools. But when you look at their instructor strategies and match them up with the grade level, you really see that was one of their strengths coming into the project, they really knew what was appropriate It seems to me like that's something they're probably really good at, that they help when necessary, when kids need help. And they also called on other people in the school like the technology person in the school to help facilitate. [E6]

On the other hand, other experts said there was no evidence of teachers changing or adapting because these data were missing. These experts needed clear and detailed records of how projects evolved "day-by-day." Due to the lack of guidance and clear definition of the expectations for the projects, teachers did not articulate clearly what strategies they

would use. In addition, these experts did not see evidence of thoughtful teachers' reflections that might have indicated teachers were solving problems and making adaptations or changes to their projects. The following comment illustrates this view:

There is no where near enough detail in report writing for me to see exactly what was done. And that was, I guess my main complaint. If I had to really objectively judge what they were doing, [from] the questionnaires and the detail in the report writing, ...[there] was no where near enough information. The lesson plans should have been done, blow-by-blow, day-by-day, what they're doing, so you can judge whether they are actually accomplishing what they're doing, the theme, the technology, the Spanish, and whether they're adapting for the kids appropriately.
[E2]

Language and culture potential

Question # 3: *From these projects, what might you assume about the opportunities for Spanish language and culture learning provided by these teachers?*

It was clear to the experts that these projects had very minimal language- and culture-learning potential. The experts suggested two reasons for this lack of language, culture, and integration. First, it might be that teachers did not receive guidance as to what strategies were appropriate to teach language and culture to children. Second, the majority of experts agree that teachers had a lot to pay attention to while developing their thematic projects. Teachers were required to develop projects that incorporated language, culture, and technology, as well as integrate content from different areas, when teachers were new to these concepts or had a minimal understanding of them. Representative comments from experts on these topics include:

Spanish language and culture learning seem to me pretty minimal in these projects, and again, there might have been much more going on with the oral language in the class and that might be the level the kids were at, but in terms of actually getting things on paper, in terms of seeing things in writing, it seems like there wasn't a

whole lot of Spanish going on. And in terms of culture, I would have hoped ... to see more cultural-related images. [E1]

That is my major qualm in terms of the overall quality; in terms of the opportunities to learn the language and culture. This is all just kind of artificially compartmentalized, and that is a problem that we've been having even with language teachers, you know, in trying to implement the National Standards that people don't [integrate curricula]. That is a skill, to be able to make connections like that across different areas, so I wouldn't expect that to be any easier for elementary school teachers expanding into FLES. [E5]

Appraisal of technology training

Question # 4: *What additions or changes could be made in the technology training for these teachers to make it more effective?*

The experts agree there needs to be a progression in the level of technology use for these teachers. Teachers who developed these thematic projects are at an early developmental stage in their use of technology. The experts forecast that teachers will move to a higher level of use if they have the support (technical and guidance). They believe teachers will move from individual personal use to student involvement; that is, moving from teacher-centered to student-centered design and development of instruction. The experts also think that requiring teachers to submit more serious reports and more thoughtful reflections would improve the development of these projects. Representative comments from experts on these topics include:

In terms of technology, they are kind of at a minimal level, but they are clearly excited about it, and I think they probably will move ahead and they've got the equipment. It may just be that they are at a developmental stage in the use of technology that they cannot move to that point. [E4]

I think they need to be required to think about what they did, so that it can move

them to a revision level, and think, 'OK, what would I do differently, how could I make this work or how could I build on what I know now and do this the next time?' I think encouraging them to think about those kinds of things would be really helpful.
[E3]

Some of the changes suggested for the training include the provision of systematic help with an explicit model of language use for technology-rich contexts. The experts also suggested guidance and training that includes additional Spanish language and culture for teachers, basic linguistics, selection of authentic materials for language learning, understanding thematic teaching, and training on assessments that align project objectives with students' language learning outcomes. Representative comments from experts on these topics include:

Teachers don't have that kind of training in language, just in basic linguistics about what language is about, and so there is a real deep kind of understanding of the whole process that is missing, I mean for how many teachers have they had anything more than just the most basic linguistics class, and for some teachers not even that I don't think it's enough to say "try to speak Spanish more," but I think it is a matter of teaching the teachers what expressions they can use in the classroom, and so really going through in a very explicit kind of model and kind of way to get them used to thinking that way. [E1]

Now in terms of the training, they would need a real clear understanding of language teaching and what they as teachers, as classroom teachers that don't really know the language well, what can they do in a classroom to promote it, and what is helpful, and what is not necessarily helpful, and with culture [they can use] because they don't seem to have involved culture at all. [E4]

Notably, one expert suggested that trainers conduct classroom observations, see what activities teachers use, and recommend ways in which technology can enhance such activities. To this extent, the expert said:

And maybe that way entail someone from the training group going to the schools and finding out some things about the types of teaching tasks that elementary teachers engage in, and sort of take notes and so when the training occurs they can say: “Oh, for example, do you know how you do this in your classroom? Now you can use this particular technology to do it.” [E5]

Recommendations for thematic projects

Question # 5: *How could we improve the development of these thematic projects to get a better product?*

In their response to this question, there were differences in the focus of opinion between higher education and classroom teacher experts. Experts from higher education offered recommendations at the conceptual level for the projects and for the process of preparing teachers to develop thematic projects. Some of the recommendations offered by these experts include:

1. Think of ways to incorporate Spanish language and culture into thematic projects. [E1, E4]
2. Include assessment and curriculum integration that are based on standards. [E3, E5]
3. Document better the projects’ development process. [E3]
4. Have choices of software, not just PowerPoint. [E4]
5. Think of how to use technology with students in the classroom in meaningful ways. [E4]
6. Differentiate technology use for (1) language and content delivery, and (2) language and interactive instruction. [E1]
7. Simulate class; have teachers act as students, and have them talk about their experiences as students. [E1]

8. Critique and offer suggestions for the projects. [E4]
9. Dialogue and reflect before and after projects are developed. [E3, E4, E5]
10. Emphasize not just knowing the technology, but applying the technology. [E5]
11. Try out projects in authentic teaching and learning classroom settings. [E5]

On the other hand, classroom teacher experts offered recommendations at the classroom level. They recommended paying attention to the student-centeredness of these projects, flexibility in the design to accommodate individualized instruction based on learner characteristics, and attention to specific classroom contexts. Some of the recommendations offered by this group of experts include:

1. Relate thematic projects to what already goes on in the classroom. [E7]
2. Determine what supplemental teaching strategies are planned, which ones are used, and which ones are appropriate for language learning by children. [E2]
3. Tailor instruction to different learners' abilities with flexible projects. [E6]
4. Implement peer-review critiques and share your work with other people. [E7]

Discussion

Quality judgments made by the experts about these thematic projects are limited to the printed materials submitted by K-6 classroom teachers to the IN-VISION project staff. Two main concerns regarding the quality of these thematic projects designed to enhance students understanding of Spanish via technology are the lack of student involvement in using Spanish and the lack of “real curriculum connections” with Spanish. In addition to the variation in quality, experts found variation in what teachers understood as “integrated thematic teaching.” More guidance and clear expectations for teachers on student-centered design, thematic planning, and a closer look at the contexts in which these projects are developed are recommended as a necessary part of the training.

The experts' comments about the quality seemed to be directed at three elements of the projects' development process—namely, training, strategies, and outcomes. For example, quality in the amount of Spanish and culture, the role played by teachers and

students, and the technology integrated in these projects could not be viewed solely as a result of the training, but also as a result of the teachers' and students' prior experiences.

Other issues that reflected weaknesses from these projects were addressed by several experts, and because of their relevance, these issues are worth mentioning. The lack of evidence of assessment accounted for the lack of clarity regarding what the students "really" get from these projects. One expert noted that the lack of a strong connection between standards and benchmarks for learning was a major shortcoming of these projects. In addition, the lack of clarity as to how the technology was used by students reflected what may be a developmental pattern observed in teachers who are novice in technology integration. To that extent, one expert noted: "This project never got around to doing it [technology] with students; it seemed to be more like a project for teachers rather than for the students" [E7]. Thus, an issue to be considered during the training of novice technology integrators is a shift in the primary focus from curriculum content to strategies on how students can use technology in ways that connect to students' real-life experiences.

As designers, teachers did not anticipate students' perspectives. Teachers might have underestimated students' abilities. Teachers need training in student use of technology in meaningful ways that would enhance Spanish language and culture learning. It is not clear to what kind of students' use of technology experts referred, because in the documentation attached to the thematic projects it is shown that students drew or manipulated pictures and images using the scanner and digital cameras. Some students used KidPix, PowerPoint, and encyclopedia CDs. Some students used the word processor to write articles, and other students digitized sound clips. The use of these technologies depended on the grade level. Older students used more technology tools than did younger students. In this regard, it seems that teachers have a clear sense of what technology tools are developmentally appropriate. However, one expert questioned the ability of K-2 students to search the Internet and use PowerPoint, word processors, and the scanner, as stipulated in at least one of the plans for a thematic project. Additionally, the question of what is teacher- or student-made in the products of the projects is not clear.

In terms of learners' fit of these materials, students completed some technology tasks, but not language or culture tasks. Teachers need to see students' perspectives and ask

whether students can handle specific tasks or whether students were highly involved. An important question to ask should be: What do students think about the materials? The students' voices and perspectives are missing in these projects. It would be interesting to observe what happens in the classroom when students are using these projects. The context in which these projects are developed and used is important, and student-spoken language and interactions from these projects are difficult to document in writing.

Technology innovations, such as those adopted by these teachers, need to be assessed by observing students and by placing learning at the center of the research agenda (Ranson, 1998). It is through the use of evaluation frameworks that instructional designers, teachers, and researchers should document the quality of the CALL materials and the impact of using those materials on student language learning and outcomes. Chapelle (1997) has suggested the use of both descriptive and evaluative CALL research methodologies in classroom settings as ways to improve CALL design and evaluation of its effectiveness in specific contexts.

In terms of the appraisal of the projects, the quality of the projects varied according to the context in which Spanish was taught. Experts agreed that some of these thematic projects were engaging, interesting, and provided students the possibility of developing an interest in learning Spanish. Other projects focused only on subject-specific content and did not use Spanish at all, while others used Spanish at a level that was beyond the students' likely proficiency level. The strength of these projects reside in their degree of community involvement, the students' creation of materials using computer technologies, the integration of different content areas, the potential for standards-based teaching, and the on-going duration of the projects throughout the school year.

Experts' opinions on the teachers' abilities to change and adapt their projects to their learners' needs were varied. Some experts agreed that teachers effectively used strategies to adapt instruction to the students' level; that teachers modeled technology use for their students, and that teachers assisted students and looked for help when needed. However, it was clear to the experts that projects needed more language- and culture-learning potential. Experts in this study agreed that there needs to be a progression in the level of technology use for these teachers. Teachers who developed these thematic projects were at an early

developmental stage in their use of technology. The experts forecast that in time teachers will move from teacher-centered to student-centered design and development of CALL instruction. Some changes suggested for the teachers' training include the provision of systematic help with an explicit model of language use for technology-rich contexts. The experts also suggested guidance and training that includes additional Spanish language and culture for teachers, basic linguistics, selection of authentic materials for language learning, understanding thematic teaching, and training on assessments that align project objectives with students' language learning outcomes. It was also suggested that trainers conduct classroom observations, see what activities teachers use, and recommend ways in which technology can enhance such activities.

Conclusions

This paper examined CALL thematic projects developed by 106 K-6 rural-school classroom teachers participating in a technology innovation training program (IN-VISION; Trayer, 2001). This teacher training program was effective in facilitating teachers' initial steps into the integration of technology for teaching Spanish to children through thematically focused and technology enriched teaching materials. However, the development of CALL thematic projects proved to be a serious challenge for these teachers because of the adoption of multiple innovations, including thematic teaching, curriculum integration, and technology applied to the teaching of Spanish. These innovations required information, guidance, and the developed skill and knowledge about both technology and Spanish language and culture. Innovations also require time to mature to permit both teachers and organizations to move through stages of adoption and/or rejection (Ellsworth, 2000; Rogers, 1995). The adoption of innovations also varies with school culture, the cooperation among teachers, and the support from the administration (Ellsworth, 2000; Becker & Riel, 2000). Teachers in this training program expressed the need for more time, guidance, and training to develop their integrative theme-based and technology enriched materials for classroom use, and wanted more time to demonstrate proficiency in the adoption of this complex innovation.

The technology training for teachers in this professional development program aimed to develop teachers' basic technology skills in a limited number of software applications. Experts who evaluated the projects produced by teachers as a result of their training noted that it was unrealistic to expect novice technology users to integrate technology on their own with Spanish and content from other curricular areas, even with this training. Experts agreed that teachers' training should concentrate on a few innovations at one time, and that additional training is needed for innovative strategies for student-centered use of technology.

Although the students' perspective was not the focus of this study, students' enthusiasm to use the technology and complete the activities designed by teachers was a positive outcome of the teacher training model used in this program. A detailed account of students' views on learning Spanish with computers can be seen in Garcia Villada's study (2006b, in preparation), which examined what students can do or would like to do when using CALL materials, as well as students' perspectives and attitudes on the use of technology for K-6 Spanish language and culture learning. In summary, to make the development process of projects more manageable for teachers, the training should pay more attention to the complex realities and contexts of teachers and students in the classroom.

There were also interesting findings on the potential for technology use in FLES, particularly in relation to professional development models similar to the IN-VISION project. The evidence analyzed from selected thematic projects produced by teachers indicated that the materials were engaging, interesting, and provided students with the possibility of developing an interest in learning Spanish. However, when compared with other examples of FLES that have been published in the literature (Doloff, 1999; Louton, 1995; Nutta, Feyton, Norwood, Meros, Yoshii, & Ducker, 2002; Shelley, 1996; Wood, 2001), these project appear to be at a stage ready for initial use in classroom contexts where qualitative and quantitative data from student language interactions and teacher reflections can be gathered for further analysis and interpretation. Testing the efficacy of these materials for teaching Spanish to children and disseminating the findings from such testing would benefit the design, development, use, and evaluation of CALL for FLES. Future professional development programs could make good use of the published examples. In addition, Harris's (1998) activity structures and Oxford's (1998) recommendations for

technology use in early foreign language learning are exceptional resources to help plan future teachers' training in the use of technology for FLES.

This study also analyzed experts' evaluation of these teachers' projects for teaching Spanish language to children using three components of an interpretivist paradigm in instructional design and evaluation specifically for the evaluation of CALL materials for FLES (García Villada, 2006a in preparation). The questionnaire that experts used to frame their analyses of teachers' projects employed an interpretivist framework for evaluation of CALL for FLES, with: (1) *multivocality*: the combined perspectives of teachers-as-developers and students, (2) *contextualization*: the context in which instruction takes place, and (3) *interpretation*: the interpretation resulting from teachers' reflections on their teaching practice.

The first component, *multivocality*, was represented by the emphasis given to the voices of teachers-as-developers and students in the design, use, and evaluation of the thematic projects. In the analyses of these projects, experts were able to find the perspective of teachers-as-developers, but were not able to discover how students made use of the materials. In this sense, the voices of teachers were present, but voices of students were lacking. The student perspective is addressed in detail in another paper (García Villada, 2006b in preparation).

The second component, *contextualization*, is related to what happens in the classroom with everyday interactions when CALL materials are developed and used. Thematic projects in this study were developed by rural school teachers who received training in Spanish language, culture, and technology. Thus, contextualization in the design and evaluation of CALL materials for FLES is linked to the type of foreign language program that is investigated when CALL is used as a complementary approach to classroom teaching in immersion, content-based, FLES, and exploratory elementary school foreign language programs (Curtain & Dahlberg, 2004). The experts also recommended changes at the user level with attention to the student-centeredness of these projects, flexibility in the design to accommodate individualized instruction based on learner characteristics, and attention to specific classroom contexts.

The third component, *interpretation*, is represented in the experts' recommendations that the professional development program develop more dialogue, reflection, and assessment of contextualized experiences for both teachers and students working with CALL materials. Although thoughtful reflections might have indicated teachers were solving problems and making adaptations or changes to their projects, but this study found little evidence of teachers' reflective practice. The experts in this study suggested that requiring teachers to submit more serious reports and more thoughtful reflections would have improved the reflection on these projects. Interpretation in CALL design and evaluation is an area for future research, and is linked with the preparation of teachers as reflective practitioners (Shon, 1983).

After a thorough evaluation of the projects in this study, it is possible conclude that the potential for CALL in FLES has yet to be fully cultivated, and that K-6 classroom teachers need more time, support, and additional training to become proficient with FLES, technology, and the development of thematic and integrative teaching. However the IN-VISION program was only a beginning for most of these teachers. Moeller and Park (2003) indicate that teachers who are trained in the use of technology for foreign language teaching and learning are likely to continue using and integrating CALL in their professional practice. It would be interesting to revisit these classrooms now that they and their schools have had time to mature with these innovations and to see whether CALL has been rejected or if it has been 'reinvented' (Rogers, 1995) to fit the K-6 classroom and the teachers' pedagogies. This paper also concludes that such a future evaluation would best take an interpretive view with multiple voices, observation of student language interactions in classroom contexts, and interpretation of teacher reflections as they work as innovators, developers, and evaluators of CALL.

Acknowledgments

I would like to thank the following individuals for sharing their expertise and for providing insightful comments, reflections, and critiques that made possible the evaluation of the sample of teacher-developed CALL materials. They are listed in alphabetical order and their geographical location at the time of their interviews for this study: Susan Calvert

Virginia), Carol Chapelle (Iowa), Debby Doloff (New Jersey), Marcia Rosenbusch (Iowa), Paris Sangrane (California), Denise Schmidt (Iowa), and Mark Warford (New York). Special thanks to Marie Trayer (Nebraska) for providing the documentation related to the teachers' professional development and the teachers' projects that were analyzed in this study. Thank you also to Edith Fernández-Baca for her assistance with the data analyses.

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Appendix A: Project Planner for K-3 Teachers**IN-VISION Technology Challenge Project**

Title of Project: _____

Theme _____ Concepts: _____

Student Outcomes/Objectives:

Assessment Strategies

Essential Knowledge/Skills

Instructional Strategies

Resources/Materials/Equipment/Internet Sites

Project Planner (cont.)

URL: _____
URL: _____
URL: _____
URL: _____

Implementation Plan/Procedures

How can the technical support staff assist me?

Appendix B: Theme/Technology Project Update Report for K-3 Teachers**IN-VISION Technology Challenge Project**

Date _____ School _____ Grades _____

Teachers _____

What was the original theme for your school?

How have you revised it? If so, what is the new theme?

What have you done up to now to complete your plan

What else needs to be done for second semester?

What technology tools/skills have you and the children used to enhance the effectiveness of your thematic project?

Is there any more support you could use to help you successfully complete your thematic project?

Appendix C: Thematic Project Final Report for K-3 Teachers**IN-VISION Technology Challenge Project**

School _____ Grades _____
Teacher _____
Theme _____

How did you revise it?

What were the key concepts students learned from doing your project?

How you would describe the success of the project?

What were things you would change to improve the project if you did it next time?

What technology tools/skills did you incorporate that were new to you and/or the students?

On a scale of 1 (little - 5 (much), rate the enhancement of the learning because of the technology use

Comments

Appendix D: Idea Sheet – WebQuest Template for 4th -6th Grade Teachers

IN-VISION Technology Challenge Project

Based with permission on a WebQuest Lesson Template created by Bernie Dodge.

WebQuest Title:

Description:

Write a short paragraph here to introduce the WebQuest to your students. If there is a role or scenario involved, such as "You are a detective trying to identify something," then here is where you'll set the stage. If there's no motivational introduction like that, use this section to provide a short advance organizer or overview.

Task:

Describe clearly what the end result of the learners' activities will be. The task could be a series of questions that must be answered; a summary to be created; a problem to be solved; a position to be formulated and defended; or anything that requires the learners to process and transform the information they gather.

Resources:

Use this space to direct students to the Web sites or the physical resources in the classroom that will be available for them to use to accomplish the task. When listing the online sites involved, be sure to write a description of each site.

Process:

What steps should the learners take to accomplish the task? List the process here.

Idea Sheet (cont.)**Learning Advice:**

Here you can provide some guidance on how to organize the information gathered. This advice could include suggestions to use flow-charts, summary tables, concept maps, or to create Web pages out of the information with links to the original sources. The advice could also take the form of a checklist of questions to analyze the information with, or things to notice or think about.

Conclusion:

Write a couple of sentences here that summarize what they will have accomplished or learned by completing this WebQuest. You might also include some rhetorical questions that encourage them to extend their thinking into other content areas.

Appendix E: List of Thematic Projects

Projects Developed by IN-VISION Teachers and Analyzed by Team of Experts

School Year 1999-2000

Project#	School	Grades	Theme
1	BCIG-IG	2	Family Pictures
2	D-O	3	Journey North
3	D-O	1-6	All on Board with Español
4	HEB	K-1	Mi favorito
5	GR-E	3	Health and Fitness
6	SID	3	Seasons/Sunrise-Sunset changes
7	D-O	4	Rainforest Rendezvous
8	SID	4	Immigration
9	HEB	2	Basic Concepts in Point Power and Books
10	GA	1	Farm Animals

Appendix F: Thematic Projects Review - Interview Questions

While you review the materials from each of the thematic projects, please keep in mind the following questions. You may want to write notes related to each of the projects.

1. What is your impression about the quality of each of these thematic projects?
2. What are the strengths and weaknesses of each of these thematic projects?
3. What evidence do you see in these projects about the teachers' ability to effectively resolve problems associated with the development of these thematic projects?
4. Are the language teaching strategies used in these projects appropriate for language learning at this grade level?
5. What strategies would students need to use to carry out these tasks? Are these strategies appropriate for this grade level?
6. What Spanish language did children produce while completing the activities associated with these thematic projects? Are these outcomes appropriate for this grade level?
7. What Hispanic culture did children experience while completing the activities associated with these thematic projects? Is this Hispanic culture appropriate for this grade level?

During the interview you may be asked to address the following questions:

1. From these projects what might you assume about the effectiveness of the teachers' training in technology?
2. From these projects what might you assume about the effectiveness of the teachers' strategies and ability to change and adapt the thematic project to the learners' needs?
3. From these projects what might you assume about the opportunities for Spanish language and culture learning provided by these teachers?
4. What additions or changes could be made in the technology training for these teachers to make it more effective?
5. How could we improve the development of these thematic projects to get a better product?

Experts' Views of the Efforts of Novice Language Teachers
Eduardo García-Villada, Ph.D. Candidate at Iowa State University

ELEMENTARY STUDENTS' VIEWS ON LEARNING SPANISH WITH COMPUTERS

A paper to be submitted to
Information Technology in Childhood Education (ITCE)
Eduardo García Villada

Abstract

Research on children's attitudes toward learning foreign languages with computers is scarce and indicates that measuring children's attitudes with a questionnaire is problematic. This is the first study to investigate the attitudes of K-8 students studying a foreign language in a technology-enhanced context, and one of only few studies using a pictorial scale to collect data. This study describes children's use of technology to learn the Spanish language and Hispanic cultures; examines children's attitudes toward learning Spanish using technology-enhanced activities; and investigates the impact of individual differences (gender, grade level, home computer access, and number of years participating in the project) on their attitudes. A survey with two versions (K-2 and grades 3-8) was developed, and 2,220 children were surveyed to discover insights into children's attitudes. The survey's content validity and reliability were established, and a factor analysis revealed four subscales in the survey. Results indicated the curriculum tasks in which children have positive attitudes toward the use of technology-enhanced activities to learn the Spanish language and Hispanic cultures. However, results also suggested that students' attitudes vary significantly across individual differences. Young children (K-2 grades) were more positive than older children (3-8 grades), and girls were more positive than boys. Children without access to a home computer were more positive than children who had a computer at home. The number of years that children studied Spanish in this project also accounted for some variance in attitudes, although not significantly. These results are discussed, with implications for future research on computer applications for early foreign language learning.

Introduction

As the use of computers at home and school becomes more ubiquitous, the application of computer technologies for instruction increases the potential for children to

learn foreign languages. Therefore, it is useful to examine the type of computer-enhanced activities preferred by elementary school students in the context of learning in the classroom (Ellis, 1990). Findings from such research may help identify factors that are useful in the design and selection of computer-assisted language learning (CALL) activities that are enjoyable for students, increase their motivation, and promote foreign language and cross-cultural learning in an increasingly technologically-oriented society.

The effectiveness of computer-assisted instruction in student academic achievement, as well as student attitudes toward learning with computers, have been studied extensively (Bangert-Drowns, Kulik, & Kulik, 1985; Bialo & Sivin, 1991; Kulik & Kulik, 1986, 1991; Kulik, Kulik, & Bangert-Drowns, 1985; Sivin-Kachala & Bialo, 1994; Sivin-Kachala, Bialo, & Langford, 1997). The effects of learning another language have been studied extensively on children's academic achievement (Rafferty, 1986; Taylor-Ward, 2003) and on children's attitudes toward learning the language (Donato, Tucker, Wudthayagorn, & Igarashi, 2000; Heining-Boynton, 1990, 1991; Kennedy, Nelson, Odell, & Austin, 2000; Rosenbusch, Garcia Villada, & Padgitt, 2003). However, reviews of the literature indicate a lack of emphasis in research on the use and effects of CALL in grades K-12 (Liu, Moore, Graham, & Lee, 2003; Zhao, 2003). The study of children's attitudes associated with their study skills when children learn with computers (Miyashita, 1994; Miyashita & Kenezek, 1992) lends perspectives that may be useful in investigating children's attitudes toward learning a foreign language with computers. Given the reported increase in the last two decades of both foreign language study in K-12 settings (Branaman & Rhodes, 1998) and the use of computers at home and school (Bureau of Census, 2002, 2003), the need to study attitudes of elementary school students toward learning foreign languages and cultures with CALL activities is overdue.

The first paper of this dissertation developed a framework for the evaluation of CALL resources in elementary schools. That framework reveals the importance of considering children's voices in CALL evaluation activities. The present study was conducted to give voices to the students, by surveying K-8 children learning Spanish in technology-enhanced foreign language classrooms that have been developed to support CALL. Surveys of young children are problematic, so this paper includes a description of

the process in which two versions of a survey were developed for students in grades K-2 and grades 3-8 to allow for differences in students' reading and developmental abilities. These versions of the survey were developed based on a review of empirical research on children's attitudes measurement, children's attitudes about learning foreign languages, and children's attitudes toward computers. The study aimed to identify recommendations for instructional developers, teachers, and administrators for further study of children's attitudes toward computers, as well as designing software and CALL activities for children that foster positive attitudes and promote students' learning of foreign languages and cultures in K-8 grade school settings. Related literature is now reviewed.

Literature Review

The measurement of young children's attitudes toward learning with computers and their predispositions toward learning the Spanish language, when they work in technology-enhanced activities, draws on multiple areas of research. This review of the literature focuses on three areas of research as described below.

The first area is the study of children's attitudes toward learning a foreign language. Data gathered from elementary school students suggest that the more positive attitudes students have toward learning a foreign language, the higher their level of attained proficiency in the foreign language. The second focus of this review is on the range of empirical evidence from research on children's attitudes toward using computers. Research showing the positive effects of television-based instruction on children's foreign language proficiency, as well as the positive attitudes expressed by children learning different tasks with computers, inform the research on children learning foreign languages with computers. Differences in age, gender, and the nature of the task being performed with computers also account for differences in the attitudes expressed by children. The third focus of this review is the development of self-assessment instruments to measure children's educational and social attitudes. Research in this field shows that children as young as kindergarten age can be instructed in survey response, and are capable of handling multiple choice instruments in pictorial format. Research indicates also that younger children prefer the extremes of a

scale. The review of literature examines these areas in the three separate sections that follow.

Children's attitudes toward studying foreign languages at the elementary school

Research on attitudes toward learning a second language documents a well-established tradition among second language acquisition studies. However, published research focuses mainly on the study of attitudes by adult learners (Gardner & Tremblay, 1994). Such research has been influenced by the belief that an underlying causal relationship is at work between maintained or modified attitudes, and the motivation and willingness to subscribe to accepted social norms (Zimbardo & Leippe, 1991). Research on attitudes also indicates that individual differences account for different rates of success in studying a second language, and factors such as aptitude, age, gender, individual learning strategies, and socioeconomic level influence the degree of success and attainment in the study of second languages (Cook, 1991).

Research on children's attitudes toward learning a foreign language indicates that students who report positive attitudes are more successful language learners than those who report negative attitudes. For example, Heining-Boynton (1989, 1991) developed a battery of attitudinal inventories (The FLES [Foreign Language in the Elementary School] Program Evaluation Inventory) for a state-mandated FLES program in North Carolina that included an attitude survey for elementary school children. The author administered the survey to 6,983 kindergarten and first grade students, and reported that "over 90 percent of the kindergarteners and first graders [felt] positively about their foreign language experience" (Heining-Boynton, 1990; p. 436). Another research study conducted by Donato, Tucker, Wudthayagorn, and Igarashi (2000) in Pennsylvania provided data from children's attitudes about language learning, as well as language proficiency measures of fifth and sixth graders learning Japanese for six years consecutively. The authors reported a positive correlation between students' high achievement scores and students' high positive attitudes toward their language experience.

Similarly, Kennedy, Nelson, Odell, and Austin (2000) tested a survey that assessed the difference in attitudes of third grade students in Idaho who studied Spanish from the

attitudes of peers who did not take part in Spanish instruction. On all five subscales of the instrument (attitudes toward school, learning, language, culture, and self) “students who participated in the FLES program demonstrated more positive attitudes than those who did not participate in the lessons” (p. 285).

In summary, even though most of the research focuses on adult second language learning, some studies on grades K-8 indicate a connection between positive attitudes and success in learning a foreign language. Consequently, this study seeks to determine the attitudes of children learning a foreign language in a context that may improve attitudes.

Children’s attitudes toward learning with computers

Research on elementary school students’ attitudes about learning foreign languages with computers is scarce. However, there is research on children learning foreign languages with television that may be useful to advance the research on children learning foreign languages with computers. The use of television in foreign language study can be traced back to the mid 1960s when specially designed programs were used to teach foreign languages to elementary school students, who participated in large-scale foreign language learning projects throughout the U.S. (Moskowitz & Amidon, 1962; Patterson, 1969; Randall, 1964; Schramm, Oberholtzer, Carter, Hayman, Hinderman, Johnson, Jones, & Mayers, 1964). Findings from research on television-based foreign language instruction indicate that children improved their foreign language proficiency over time when children learn the foreign language aided by television. For example, Schramm et al. (1964), in a report of the final findings of the Denver-Stanford project in Denver, Colorado, concluded that: (1) even a teacher inexperienced in Spanish could learn to manage efficiently a combination of activities built around television, (2) the kind of instruction that worked best depended heavily on student-teacher involvement, (3) teacher motivation, preparation, experience, and language proficiency was positively related to student proficiency, and (4) a teacher’s freedom to control and individualize the method and materials was considered to be the most important findings of that study (pp. 152-160). From the teacher’s perspective freedom over the design of instruction would be desirable.

In 1969, another large-scale research project that studied the effect of television on children's foreign language proficiency was conducted in Michigan by Patterson (1969). The focus of her comprehensive case study was on the "Detroit Public Schools Television Teaching Project." Patterson concluded that elementary school students in classes taught by television were successful in learning a foreign language and that students were "able to advance successfully from an oral language course in the third grade to where they could read and understand Spanish words and phrases in the courses in grades four and five" (Patterson, 1969, pp. 187-188).

The development of surveys to measure adult attitudes toward computers was the focus of numerous research studies that were parallel to the integration of computers into schools and the spread of information technology in the 1990s. That research on attitudes was summarized by Gardner, Discenza, and Dukes (1993) in a meta-analysis study that compared the relative qualities of reliability and construct validity of four existing computer attitude scales (ATC, CAS, CAIN, and BELCAT, p. 489). The researchers were interested in studying "computer anxiety" as a construct, as well as finding a shorter version of a computer attitude measure that could be completed quickly. The authors concluded, based on a factor analysis, that "researchers would have more than adequate measures of computer attitudes using **any one** [bolded in the original] of the four original, unedited, measures" (p. 493). As a result, selection of the scale would depend on the interest of each research study. A readability test was also used to determine which of the four measures was more readable. The test resulted in favor of the BELCAT (Blomberg-Lowery Computer Attitude Task) as the easiest to read among the four choices.

Until then, the study of children's attitudes toward learning with computers was minimal. However, studies of international scope conducted between Japan and the U.S. (Miyashita, 1994; Miyashita & Knezek, 1992) prepared the ground for further research in the area. Miyashita and Knezek (1992) derived the "Young Children's Computer Inventory" from the English version of a 115-item survey originally developed by Sakamoto (1985) of Tokyo Institute of Technology. Sakamoto's survey subscales (attitude toward computers, creativity, motivation to study, and empathy) were taken from other survey sources developed in the 1980s and used with fourth graders in a UNESCO study

(Sakamoto, 1984). The first two versions of the “Young Children’s Computer Inventory” used a Likert-type set of order options with three choices (disagree, undecided, and agree). In version three, the authors suggested a Likert-type set of order options with four choices (no, maybe no, maybe yes, and yes), previewing complications in a pre-test/post-test situation when changes in attitude may occur and a dichotomous variable is used.

Miyashita and Knezek (1992) found that U.S. children selected “agree” as the preferred choice. A factor analysis also verified findings similar to Sakamoto’s four subscales. The studies carried out in Japan and the U.S. by Miyashita and Knezek led Miyashita (1994) to conduct a study in Japan where location (urban, suburban, and rural schools), grade (first and second), and computer access (used as control) were the variables investigated as possible factors in predicting young children’s attitudes toward computers. Results from the study indicated that only the “computer attitudes” construct was statistically significant, and that first graders were more positive than second graders, controlling for computer ownership. The author conducted a further analysis on computer experience with Computer-Assisted Instruction (CAI) use in the urban location, CAI and LOGO (a programming language) in the suburban location, and word processing and graphics in the rural location. Children’s initial attitudes toward computers improved after they used CAI, LOGO, word processing, or graphic applications.

In summary, only a few research studies of large scale projects found that children’s foreign language proficiency increased as a result of children’s participation in a project that combined a television course with live instruction as the medium for foreign language learning. Also, a few studies revealed that young children were more positive than older children, and that the children’s attitudes varied significantly according to the different curriculum tasks that children were assigned to study when using computers. Findings from these few but seminal research studies on children’s attitudes and their use of media to learn foreign languages are used in the present study as a basis to investigate and expand the knowledge of how computers can be used to enhance children’s foreign language learning.

Measuring children's attitudes and developing self-assessment instruments

Research on instrument development to measure children's general attitudes reveals important aspects of the administration of self-report surveys to PreK-2 grade students. Results from studies administering surveys to children have yielded statistically reliable results. These studies also indicate that if children are instructed properly, they are capable of handling more than two response choices, younger children prefer responses leaning toward the positive side of the scale, and children prefer scales with picture representations of the choices.

Several decades of research since the late 1960s have produced instruments to measure children's educational attitudes, in general (Colwell, James, Jun, & Marchisio, 1975; Harvill, 1971; Macklin & Machleit, 1990), in school subject areas such as math, reading, and art (Harvill, 1971; Redelheim, 1971), and foreign languages (Donato, Tucker, Wudthayagorn, & Igarashi, 2000; Heining-Boynton, 1990, 1991; Kennedy, Nelson, Odell, & Austin, 2000; Rosenbusch, Garcia Villada, & Padgitt, 2003). Surveys to measure children's social attitudes also have been developed in areas including ethnocentrism and tolerance toward minorities (Insel & Wilson, 1970; Jackson & Klinger, 1971), the elderly (Jantz, 1976), and the handicapped (Beardsley, 1982). Other research on attitudes include children's attitudes toward television commercials (Rossiter, 1993), the environment (Musser & Malkus, 1994), and gender stereotyping (Sheridan, 1978).

Insel and Wilson (1970), from the Institute of Psychiatry of the University of London, developed the "Children's Scale of Social Attitudes." Two special features of this instrument are the simplicity of the language and "the use of one- or two-word items for economy of the survey and to avoid young respondent's confusion from long and complex leading questions" (p. 4). The authors also were interested in correlating children's attitudinal results with their personality and interests, age, social class, and intelligence. A correlation study with four personality scales concluded that their instrument was useful in studying "the process involved in attitude development" (p. 18), and "because of its straightforward nature, the approach would seem to be a particularly appropriate choice for studying the social attitudes of children" (p. 18).

Harvill (1971) conducted a study to determine the best method or methods for measuring attitudes toward school subject matter in the lower primary grades. The research indicated that one difficulty with self-report inventories at the elementary school level is the readability and interpretability of the attitude instrument; another difficulty is the self-insight and conscientiousness with which the pupils fill out the inventory. Harvill's study administered five scales at random (Picture Scale, Forced Choice Scale, Millimeter Scale, Box Scale, and Semantic Differential Scale) to students in two second grade classrooms ($n=46$) and two third grade classrooms ($n=38$) in public schools of Vermillion, SD. Directions were given verbally and scales containing written material were read to the students. It took between 40 and 50 minutes to administer all five scales in the four classrooms. Three scores were obtained from each of the five scales: attitudes toward arithmetic, reading, and art. Harvill concluded that group attitude scales concerning school subjects can be administered to second and third graders with few problems and very few errors. Second graders also are more likely to choose one of the extremes in expressing their attitudes when compared with third graders. In general, children in the study enjoyed the Picture Scale better than the other scales.

Colwell, James, Jun, and Marchisio (1975) studied the relationships between children's attitudes toward school and academic achievement, and between self-concept and academic achievement. The authors described the procedures for the development, validation, sampling, and modifications to the original instrument. Their study also included the development of survey administration by video and a special answer-sheet with large and small box sizes for "yes" and "no" choices. A major contribution to the study of children's attitudes from Colwell et al.'s study was the "development of a written response procedure, which groups of first through fourth grade children could handle with relative ease, and yielded more response variance than most of the dichotomously scaled instruments used with young children" (p. 2).

Based on the item distribution of responses, Colwell et al. (1975) concluded that children can discriminate beyond simple dichotomous scales because enough variation was reported, although a tendency towards positive or favorable responses was observed. In Colwell et al.'s study three dimensions of school attitudes were hypothesized: general school

attitude, peer relations, and self-concept. A factor analysis was conducted with reliability tests for pre- and post-survey administration. Cronbach's alpha values ranged from 0.8 to 0.46, with intrapersonal self-concept yielding the weakest result. The authors concluded that the inventory failed to predict achievement or other observable school behaviors (p. 21). "Student attitudes then become 'ascribed' to students rather than 'residing' within them" (p. 22). However, the instrument was judged to be reliable one with a standardized procedure for its administration.

Beardley (1982) developed an inventory to measure the attitudes of non-handicapped elementary school-age children toward their handicapped peers that included speech and hearing impairments, mental deficiencies, learning disabilities, and behavioral disorders. For the study, Beardley developed the "Children's Social Attitudes Inventory" consisting of 38 items with five response categories ranging from "very unhappy" to "very happy." Based on the data obtained from 116 third grade students, Beardley found that her survey had correlation values of 0.60 between the items and the total scores, a wide range of responses, and a coefficient alpha greater than 0.75, indicating that the instrument was valid and reliable.

In summary, the literature indicates that children who learn a foreign language have more positive attitudes toward language learning than those students who do not learn foreign languages. Also, children who learn a foreign language and have positive attitudes achieve higher levels of proficiency than do students who have less positive attitudes. In terms of using technology to enhance learning, studies suggest that when children learn a foreign language with television, they report positive attitudes toward learning the language and improving their proficiency in the language. Similarly, in regard to the use of computers, studies indicate that children express positive attitudes toward learning with computers in general. Younger children are more positive about learning with computers than older children, and, in general, children improve their attitudes about learning with computers independently from the type of application or computer task they used. Research on children's attitudes also indicates that well-designed and administered surveys yield reliable and valid results about children's attitudes. Finally, research on children's attitudes toward learning foreign languages with computers is scarce. Therefore, this study was

designed to examine the attitudes of elementary school children learning Spanish with the aid of computers.

Rationale for the Study

Research on second language acquisition by children in different grades indicates that students report positive attitudes about learning a foreign language (Heining-Boynton, 1990; Kennedy, Nelson, Odell, & Austin, 2000) and that those who report positive attitudes are more successful language learners than students who have negative attitudes (Donato, Tucker, Wudthayagorn, & Igarashi, 2000). It has been hypothesized that computer-enhanced materials might be beneficial to foreign language learning, if the activities that are designed to provide opportunities for learners focus on aspects of language, provide opportunities to receive modified input, negotiate meaning through interaction, and modify linguistic output (Chapelle, 1998). Equally important is that computer-enhanced materials be integrated into instruction and delivered through “multiple instructional methodologies” where successful instruction should not only present information, but also guide the student, provide opportunities for student practice, and allow assessment of the student’s learning (Alessi & Trollip, 1991).

In addition to using second language acquisition theory and instructional design principles, research on use of computers in early childhood education (Brown, 1996; Henniger, 1994) may be informative to the design and integration of computer-enhanced materials to study foreign languages at the elementary school. A small number of studies have looked at the use of computer technologies for elementary school foreign language instruction (Doloff, 1999; Nutta, Feyton, Norwood, Meros, Yoshii, & Ducker, 2002; Shelley, 1996). These studies suggested that students were enthusiastic about learning the foreign language and communicating with others using email and internet exchanges. Thus, their motivation may help students improve their foreign language skills and cultural sensitivity over time.

Research on children’s attitudes toward the use of computers for learning indicates that students are motivated to use computers and that this motivation leads to positive attitudes; however, the attitudes vary according to gender, age, experience, and the nature of

the task (Miyashita, 1994; Miyashita & Kenezek, 1992). However, one topic that merits further investigation is the study of transferring motivation to use technology into positive attitudes toward learning a foreign language.

The Study and Research Questions

The purpose of this study is to examine the attitudes of K-8 students in the United States toward applications of computer technologies to learn the Spanish language, with an emphasis on communication and work with their peers. In addition, students' attitudes toward the study of Spanish with computers were studied, in combination with students' individual differences, including grade level, gender, number of years studying the language, and home-computer access. The purpose of the study was articulated in the following research questions:

1. What are children's attitudes toward learning the Spanish language with the aid of computers?
2. What are children's views on the application of computers to communicate with others, and / or searching the Internet when learning Spanish?
3. How do students' grade level, gender, access to a home computer, and the number of years participating in the technology-enhanced classroom relate to students' attitudes toward using computers to learn the Spanish language?

Context of the Study

The IN-VISION project provided an opportunity to study technology-enhanced foreign language instruction in the Midwest of the U.S. In this project, elementary school classroom teachers with minimal experience using technology and no proficiency in the Spanish language received training in both the integration of technology into classroom activities and in the Spanish language. Elementary school classroom teachers received professional development in Spanish language teaching methods and strategies for teaching a foreign language to children. These teachers also received ongoing technology support on-site, and training in the use of technology and the integration of the Spanish language

into other school subject areas. In addition, the project provided support in the form of hardware and software to participating teachers, materials for classroom use in the Spanish language, and a bi-weekly professional development program conducted via the Iowa Communication Network (ICN) or the Nebraska distance education network. The trainers delivered instruction and communicated synchronously with teachers at several remote sites simultaneously using video conference technologies. In terms of resources, teacher training, and the student body were similar for all participating schools. Thus, this context was ideal to examine elementary students' views on learning the Spanish language with computers.

The IN-VISION project began classroom instruction in the Fall of 1998 in eight small rural school districts located in Iowa and Nebraska. A standards-based curriculum was developed for the project by the project staff in consultation with practicing elementary school Spanish teachers, and students in grades K-8 studied Spanish language for 20-30 minutes per week throughout the school year with Spanish-speaking language associates, most of whom were not trained as elementary teachers. The classroom teachers reinforced the language and cultural instruction, and integrated the Spanish language into the teaching of other school subjects through a combination of strategies and methods that included the viewing of a Spanish video series once or twice a week (Rosenbusch, Garcia Villada, & Padgitt, 2003; Trayer, 2001; Trayer & Knoche, 2002).

Student attitudes, the Spanish language, and related assessments

Rosenbusch, Garcia Villada, and Padgitt (2003) reported on the changing attitudes toward language and culture learning of K-5 students, who participated in the IN-VISION project. The IN-VISION project was evaluated annually and reports were issued with formative and summative evaluations that provided measures of participants' attitudes and satisfaction with the project as well as ratings of student and teacher language proficiency. Results indicated that attitudes were generally positive, but the attitudes of students in grades 3-5 were less positive than those in K-2. The authors found that after one year of participation in the project, K-5 students, who began with a positive attitude toward Spanish language and Hispanic cultures, continued to report positive attitudes in four items of the attitudinal survey. However, three of these items showed a small decrease in the percentage

of positive responses (p. 162). The authors interpreted the small, but statistically significant, attitudinal changes from positive to less positive, as a small decline in the novelty effect of being exposed to the sounds of Spanish and to working with a native Spanish speaking instructor.

During the same year, the Spanish language proficiency of 102 randomly selected students participating in this project was assessed using the “Student Oral Proficiency Assessment” (SOPA) (Boyson, Rhodes, & Thompson, 1998). Results of the SOPA ratings were consistent with instructed second language acquisition research and theory, indicating that the majority of K-5 grade students (96%) were able to perform more comprehension tasks than oral fluency tasks (Rosenbusch, Garcia Villada, & Padgitt, 2003).

In addition, baseline and follow up data were collected on teacher technology skills and attitudes toward participation in the project. Parents and school administrators also were surveyed as part of the project evaluation. The project did not specify any goal for assessing student technology skills and attitudes towards learning Spanish using computers. However, the project evaluation team, in consultation with the project director, suggested the inclusion of a student technology survey as part of the project evaluation. The goal of such a survey was to investigate children’s attitudes toward using computers to learn Spanish, and to describe the student practices with computer technologies to learn Spanish language and Hispanic cultures.

Methodology

The research reviewed earlier on instrument development for young children shows the need for special consideration to be given to the design and administration of surveys to study children’s attitudes toward areas such as school, self-concept, peer relations, school subjects, and foreign languages. Young children tend to express more positive attitudes than older children, and they prefer response choices represented in pictorial format. Therefore, two versions of a technology survey for students were developed (one for Grades K-2 and one for Grades 3-8), on the basis of the literature review described above, which focused on children’s self-assessment of their attitudes across content areas and their attitudes toward learning with computers (Beardsley, 1982; Colwell, James, Jun, & Marchisio, 1975; Harvill,

1971; Insel & Wilson, 1970; Macklin & Machleit, 1990; Miyashita, 1994; Miyashita & Knezek, 1992). Measures of student attitudes and use of computers in grades K-8 for learning Spanish were validated, and the two versions of the survey will now be described.

Instrument development

Previous research has suggested that young children as early as pre-schoolers, if properly guided, can express their preferences to questions with more than two choices for answers (Beardsley, 1982; Colwell, James, Jun, & Marchisio, 1975; Harvill, 1971; Insel & Wilson, 1970; Macklin & Machleit, 1990). In addition to these findings, the present study followed the recommendations from Miyashita and Knezek (1992), and Miyashita (1994) for this age group and developed a four-choice Likert-type scale inventory. Also, the process of selecting items in Insel and Wilson's (1970) study and the methodology for instrument development in Beardley's (1982) study informed the development of the Student Technology Survey and were followed closely in the present study. Specifically, findings from these studies helped in the process of developing the two versions of the survey, including the writing and selection of items, a feasibility study, a pilot study, and an item analysis to determine the validity and reliability of the survey. Previous research also guided this study in the manner in which the survey was administered and the way children were asked to select their preferences. Harvill's (1971) recommendation on the use of pictorial choices was also adopted to represent the four-choice Likert-type scale with a range of faces from "smiley" to "sad" for students in K-2 grades.

In addition, educational research that focused on evaluating the effectiveness of computer-enhanced instruction on children's academic achievement (Kulik & Kulik, 1991; Sivin-Kachala, Bialo, & Langford, 1997), as well as basic computer skill standards for children in grades K-8 proposed by the International Society for Technology in Education (ISTE, 1999), were considered in the development of the Student Technology Survey. An initial pool of 75 items was created, based on a combination of ideas collected from the professional literature cited. Other sources of information for the development of the survey included observations of student computer use in student training sessions provided by the

IN-VISION project; interviews with project students, parents, and teachers; and advice from experts in computer-assisted language learning (Chapelle, 1998).

The Student Technology Survey asks students to express their level of agreement with statements addressing their preference to learn Spanish using computers, their use of computer technologies to learn about the Spanish language, their predisposition for collaborative work, and their attitude toward using computers to solve problems, think critically, and develop computer skills. In addition, the survey asks students to report on their use of computers to communicate with others, whether they have access to a computer at home, their knowledge about how to use the Internet safely, and their ability to judge fact from opinion in the information they access on the Internet.

Two versions of the survey were developed, one for students in grades K-2 (15 items) and one for grades 3-8 (20 items) (see Appendices A and B, respectively). The version of the survey for students in grades K-2 had four response categories. Smiley and sad faces represented the response categories for these students: a very unhappy face indicated "No," an unhappy face indicated "Maybe No," a smiley face indicated "Maybe Yes," and a very smiley face indicated "Yes." Classroom teachers were asked to read the items to students in grades K-2 since they are beginning readers. The version of the survey for students in grades 3-8 included the same 15 items as the version for K-2 students plus 5 additional items. There were four response categories for these students as well, but, instead of being represented as faces, students were asked to check the correct box from among the four options: "No," "Maybe No," "Maybe Yes," and "Yes." Specifically, the study considered student attitudes toward the use of technology to learn the Spanish language, to communicate with others, and to work cooperatively. In addition, this study identified affective issues related to computer use and the nature of the preferred CALL activities by K-8 grade students.

There were two types of questions in the survey: attitudinal and factual. The attitudinal items referred to likes and dislikes about using computers and studying the Spanish language and cultures with computers. The factual items referred to whether or not a particular activity or application was experienced by the students, while participating in

the technology enhanced project. The analysis of these two types of questions was completed separately for each of the age/grade groups.

Content validity

The surveys were developed with careful attention to validity as recommended by Isaac and Michael (1995), and Gall, Borg, and Gall (1996). Content validity was evaluated by interviewing four educators with expertise in elementary education, foreign language teaching, and technology use: a professor of teaching methods for foreign languages in elementary schools, a kindergarten teacher, a teacher of a foreign language at the elementary school level, and an elementary school English as a second language (ESL) teacher. They were asked to comment on the content and level of difficulty of the language in the questions, as well as the appropriateness of a four-choice Likert-type set of ordered options for lower-grade elementary school students. General comments for improvement of the survey also were sought from these educators. These comments were used to narrow the number of items and to improve the readability of the survey. The survey was pilot tested in four classrooms ($n = 87$ students, 38 in second grade and 49 in fourth grade) in a Midwestern public suburban school district that has had a foreign language program in the elementary school for over 10 years. The pilot test resulted in minor revisions in the language of two items to improve administration of the survey.

Participants

The subjects of the study were 2,220 students from 15 participating schools in the five-year Iowa/Nebraska Technology Innovation Challenge Project (IN-VISION) (Trayer, 2001) during the 2000-2001 school year, the fourth year of the project. As Table 1 indicates, the majority of the students were in grades K-5 (88.5%), and a small percentage of the students were in grades 6-8 (11.5%).

The participants were 47% female and 53% male. The majority of the schools were rural and public, with the exception of 2 that were parochial. Schools had similar student body in terms of their socioeconomic level, racial, and ethnic composition. The majority of students came from English-speaking homes and only one school had a sizeable

concentration of Spanish-speaking immigrant children. However, native speakers of Spanish represented only 3% of the students in the IN-VISION project.

Table 1. Number of students who answered the survey by grade level

Grade	Number of Students	Percentage	Survey Version
K	298	13.4%	Pictorial version (40.7%)
1	295	13.3%	
2	311	14.0%	
3	336	15.1%	Textual version (59.3%)
4	360	16.2%	
5	365	16.4%	
6	211	9.5%	
7	17	0.8%	
8	27	1.2%	
Total	2,220	100%	100%

Survey procedures

Classroom teachers received copies of the survey for each student in their classroom and were asked to distribute, administer, and collect the survey from their students after completion. The researcher was not present in any of the classrooms during the administration of the survey. Directions on how to instruct students to complete the survey were given to each teacher (see Appendices C and D). Students were given a sample item to practice on before completing the survey. Teachers were asked to make sure that students understood the directions before beginning the survey. After the surveys were completed, the teachers collected and mailed them to the researcher in pre-paid envelopes. Follow-up phone calls resulted in 100% return rate from the teachers.

Survey results

In April 2001, the survey in its two versions (pictorial and textual) was administered to 2,220 students participating in the IN-VISION project. For statistical analysis, answers were assigned numerical values: “No” = 1, “Maybe No” = 2, “Maybe Yes” = 3, and “Yes” = 4. A general computer attitude score (GENATT) was created by adding the score values of all attitudinal items (11 items) in the survey. Score values were reverse-coded/converted on

items stated negatively (Items 5 and 9) so that all items would have the same response order. This correction of the scores made possible inter-item comparison and interpretation.

Survey reliability

An item analysis and a reliability test on the survey were conducted after surveys were completed and returned to the researcher. Table 2 provides a summary of the GENATT mean scores, Cronbach's alpha values, and the mean inter-item correlation (r) values of the surveys completed by K-2 and 3-8 grade students when they are considered individually and when all cases are merged. The five additional items answered by students in grades 3-8 are analyzed separately.

These Cronbach's alpha values indicate an "acceptable" overall index of the repeatability, or internal consistency, of the scale as a whole, except for the Alpha value of the five items to which only students in grades 3-8 responded, which could be considered "poor" (George & Mallery, 2003, p. 231). The mean inter-item correlations, and the minimum and maximum inter-item correlations, are also included in Table 2. Based on these values, a wide range of positive and negative correlation values, from as weak as $r(2, 5) = -0.22$ to a strong $r(1, 3) = 0.65$, are present among the items. Regardless of the poor alpha values from the last five items of the survey for older students, all data were analyzed.

Table 2. Cronbach Alpha Coefficients and Inter-Item Correlations for the Student Technology Survey

Survey	Number of Items	Number of Cases	GENATT Mean	SD	Alpha Value	Mean r Value	Min. r	Max. r
K-2	11	700	35.08	5.33	0.62	0.14	-0.05	0.59
3-8	11	1,201	30.57	5.42	0.63	0.13	-0.22	0.64
ALL ^a	11	1,901	32.23	5.81	0.67	0.16	-0.13	0.65
3-8 ^b	5	1,262	13.77	3.22	0.47	0.15	0.04	0.35

^a Includes K-2 and 3-8 combined responses.

^b Responses to items 16-20 of grades 3-8 survey are considered separately.

Results from the survey on attitudinal and application questions are presented in the sections below. First, the attitudes of grades K-2 students are presented, followed by the attitudes of grades 3-8 students. Then, the attitude data of all students in grades K-8 are aggregated and results are presented for the combined group. Subsequently, the answers to the survey on computer applications are presented and the research questions are addressed.

Attitudes of students in lower elementary grades (K-2)

Table 3 presents the ranked means (from highest to lowest) and standard deviations of 11 attitudinal items of the survey, including only the answers from students in grades K-2. The value of 2.5 corresponds to the midpoint between the two extremes of the scoring scale (“No” = 1 and “Yes” = 4). As a point of reference, this arbitrary value of 2.5 helps explain the responses whose Mean score values are above and below the midpoint of the scale. Caution should be exercised when interpreting the value of 2.5 as “neutral.” In reality, the distribution of scores may be generally skewed toward the positive (“Maybe yes” = 3, “Yes” = 4) end of the scale. Thus, mean values above 2.5 are considered favorable attitudes, while values below 2.5 are considered unfavorable.

Students in grades K-2 reported favorable attitudes on 10 out of the 11 attitudinal questions of the survey. Means and converted means for this group ranged from 3.65 to 1.93. Items with the highest means indicating favorable responses were Item 2, “I like using computers to experiment, to discover, or to explore things” (mean 3.65), and Item 13, “I like using computers to create, design, or to invent things” (mean 3.59). In contrast, students in grades K-2 reported unfavorable attitudes on 1 out of the 11 attitudinal questions. That item was Item 9 (reverse-coded) worded, “When I am using a computer, I like to work with others” (converted mean 1.93). Working collaboratively is a behavior that may indicate willingness to learn Spanish with others around computers. As is generally the case, the more a student works with others, the higher the chances to interact in the language. For this reason, working with others, in theory, is seen here as a desirable behavior and a favorable condition for negotiating language meaning and second language acquisition. Observations are needed to document whether students negotiate meaning while working with others in computer-rich contexts.

Table 3. Attitude Items of Student Computer Survey (Grades K-2) — Ranked Means with Standard Deviations

Statement	Mean	SD	N
2. I like using computers to experiment, to discover, or to explore things.	3.65	.74	875
13. I like using computers to create, design, or to invent things.	3.59	.88	871
4. I like using computers to solve problems.	3.50	.93	876
12. Working with computers helps me think better.	3.48	.97	879
1. I like Spanish lessons on the computer.	3.41	.99	859
3. I want to keep learning Spanish using a computer.	3.25	1.09	874
6. I like using computers to learn about other people who speak Spanish.	3.19	1.13	853
5. I get bored when my teacher asks us to do things on the computer.	1.82 (3.18)*	1.24	865
14. The computer activities I learn in Spanish help me be more patient with people who speak other languages.	3.14	1.18	862
7. I work more with other students because of computers.	2.98	1.24	862
9. When I am using a computer, I like to work alone.	3.07 (1.93)*	1.27	858

* This is an adjusted mean using reversed score values to allow for inter-item comparison

Attitudes of students in upper elementary grades (3-8)

Table 4 presents the ranked means and standard deviations for the 11 attitudinal items of the survey including only the answers from students in grades 3-8. This group of students reported favorable attitudes on 7 out of the 11 attitudinal questions of the survey. Means and converted means for this group ranged from 3.64 to 2.08, with means for four items equal or below 2.5, the mid point of the scoring scale. The three items with the highest mean values indicating favorable attitudes were Item 2, "I like using computers to experiment, to discover, or to explore things" (mean 3.64), Item 5 (reverse-coded) worded, "I am interested when my teacher asks us to do things on the computer" (converted mean 3.47), and Item 13, "I like using computers to create, design, or to invent things" (mean

3.47). In contrast, the item with the lowest mean value indicating unfavorable attitudes was Item 9 (reverse-coded) worded, “When I am using a computer, I like to work with others” (converted mean 2.08).

Table 4. Attitude Items of Student Computer Survey (Grades 3-8) — Ranked Means with Standard Deviations

Statement	Mean	SD	N
2. I like using computers to experiment, to discover, or to explore things.	3.64	.75	1309
5. I get bored when my teacher asks us to do things on the computer.	1.53 (3.47)*	.93	1292
13. I like using computers to create, design, or to invent things.	3.47	.96	1304
4. I like using computers to solve problems.	3.25	1.02	1299
12. Working with computers helps me think better.	2.92	1.12	1303
1. I like Spanish lessons on the computer.	2.84	1.05	1287
3. I want to keep learning Spanish using a computer.	2.68	1.13	1306
14. The computer activities I learn in Spanish help me be more patient with people who speak other languages.	2.50	1.17	1292
6. I like using computers to learn about other people who speak Spanish.	2.48	1.18	1283
7. I work more with other students because of computers.	2.32	1.19	1288
9. When I am using a computer, I like to work alone.	2.92 (2.08)*	1.21	1304

* This is an adjusted mean using reversed score values to allow for inter-item comparison

Table 5 presents the ranked means and standard deviations from items 16 through 20. Only students in grades 3-8 were asked to respond to these items. Mean values above 2.5, from highest to lowest, indicating favorable responses from grades 3-8 students, include Item 18, “I know how to use the Internet safely” (mean 3.53), and Item 17, “I know how to separate fact from opinion in the information I access on the Internet” (mean 3.08). Items with mean values below 2.5, from highest to lowest, indicating unfavorable responses from

grades 3-8 students, include Item 20, “I like to use computers to learn about Spanish-speaking people and countries” (mean 2.49), Item 19 “When we use computers for Spanish, we have more class conversations and participation” (mean 2.44), and Item 16, “Students in my classroom are collaborating with other classrooms to solve problems, collect and analyze data, or create stories, presentations, and artwork” (mean 2.25).

Table 5. Attitude Items Answered by Students in Grades 3-8 Only — Ranked Means with Standard Deviations

Statement	Mean	SD	N
18. I know how to use the Internet safely.	3.53	.93	1288
17. I know how to separate fact from opinion in the information I access on the Internet.	3.08	1.12	1288
20. I like to use computers to learn about Spanish-speaking people and countries.	2.49	1.21	1311
19. When we use computers for Spanish, we have more class conversations and participation.	2.44	1.16	1285
16. Students in my classroom are collaborating with other classrooms to solve problems, collect and analyze data, or create stories, presentations, and artwork.	2.25	1.25	1288

Attitudes of students in grades K-8 combined

Table 6 presents the ranked means and standard deviations from the combined responses of all students in grades K-8 on the 11 attitudinal questions of the survey. Students expressed favorable attitudes to the majority of the attitudinal items (10 out of 11) in the survey. Means and converted means for all students combined ranged from 3.64 to 2.02. Items with the highest means were the same as those for K-2 and 3-8 grades considered separately: Items 2 (mean 3.64) and 13 (mean 3.52). In contrast, all students in grades K-8 reported unfavorable attitudes on only 1 item out of the 11 attitudinal questions in the survey. The item with the lowest mean values indicating unfavorable attitudes was the same as that for K-2 and 3-8 grades considered separately, Item 9 (reverse-coded) worded, “When I am using a computer, I like to work with others” (converted mean 2.02).

Table 6. Attitude Items of Student Computer Survey (Grades K-8) — Ranked Means with Standard Deviations

Statement	Mean	SD	N
2. I like using computers to experiment, to discover, or to explore things.	3.64	0.75	2184
13. I like using computers to create, design, or to invent things.	3.52	0.93	2175
4. I like using computers to solve problems.	3.35	0.99	2175
5. I get bored when my teacher asks us to do things on the computer.	1.65 (3.35)*	1.07	2157
12. Working with computers helps me think better.	3.14	1.09	2182
1. I like Spanish lessons on the computer.	3.07	1.06	2146
3. I want to keep learning Spanish using a computer.	2.91	1.15	2180
6. I like using computers to learn about other people who speak Spanish.	2.76	1.21	2136
14. The computer activities I learn in Spanish help me be more patient with people who speak other languages.	2.75	1.22	2154
7. I work more with other students because of computers.	2.58	1.25	2150
9. When I am using a computer, I like to work alone.	2.98 (2.02)*	1.24	2162

* This is an adjusted mean using reversed score values to allow for inter-item comparison

Both lower and upper-elementary grade students expressed the highest levels of positive attitudes to Item 2 and 13 of the survey. Their answers indicate that students in grades K-8 like using computers for innovative and creative work. In terms of availability of computers at home (Item 15), 85% of the students in grades K-8 reported having a home computer.

Applications of technology in lower and upper elementary grades

On several occasions, this researcher observed the training sessions offered to teachers and students conducted by the IN-VISION project staff. Teachers and students received training in the following technologies: WebQuests, PowerPoint, HyperStudio,

Internet searching for information on Spanish-speaking countries, national and international email exchange projects, word processing, and Webpage design and development (Trayer & Knoche, 2002).

As Table 7 indicates, students in grades K-2 reported disagreement with 3 statements in the survey about computer use. The mean values of these items were lower than 2.0, or between “No” and “Maybe No,” indicating that these uses did not happen in the classroom. The 3 items are related to the use of computers to search the Internet and computers to communicate with students (i.e., email and chat-rooms) from other schools within the project and from Spanish-speaking countries. The items are Item 8 (“I use computers to talk to students at other schools”) (mean 1.92), Item 10 (“I use computers to communicate with students from Spanish-speaking countries”) (mean 1.55), and Item 11 (“I search the Internet for information on Spanish-speaking countries”) (mean 1.94).

Table 7. Factual Items on Student Computer Survey — Means and Standard Deviations

Statement	Respondents	Mean	SD	Total N
8. I use computers to talk to students at other schools.	<i>Grades K-2</i>	1.94	1.32	845
	<i>Grades 3-8</i>	1.93	1.20	1288
	<i>Grades K-8 Combined</i>	1.93	1.23	2133
10. I use computers to communicate with students from Spanish-speaking countries.	<i>Grades K-2</i>	1.55	1.08	847
	<i>Grades 3-8</i>	1.44	.95	1281
	<i>Grades K-8 Combined</i>	1.48	1.00	2128
11. I search the Internet for information on Spanish-speaking countries.	<i>Grades K-2</i>	1.92	1.27	850
	<i>Grades 3-8</i>	1.86	1.25	1306
	<i>Grades K-8 Combined</i>	1.89	1.28	2156

Similar to their younger counterparts, students in grades 3-8 reported disagreement with the same 3 statements in the survey about computer use. The mean values of the items are below 2.0 and indicate that these uses did not happen in the classroom. These items were Item 8 (mean 1.93), Item 10 (mean 1.44), and Item 11 (mean 1.86). When the answers

of all students in K-8 grades were combined, students report disagreement with the same 3 statements in the survey about computer use to search the Internet and the use of computers for communications. Again, the items were Item 8 (mean 1.93), Item 10 (mean 1.48), and Item 11 (mean 1.89).

Factor analysis

The dimensionality of items 1 through 14 of the Student Technology Survey (K-8 grades combined) was analyzed using maximum likelihood factor analysis (see Appendix E). The factors were rotated using the Oblimin procedure with Kaiser Normalization (Green, Salkind, & Akey, 2000). The rotated solution yielded four interpretable factors: (1) technology for language and culture learning (TKLC), (2) technology for communications (TKCOMM), (3) technology for constructivist learning (TKCONST), and (4) affective issues of technology (TKAFFECT). The TKLC factor accounted for 23.7% of the item variance, the TKCOMM factor accounted for 10.0%, the TKCONST factor accounted for 8.8%, and the TKAFFECT factor accounted for 7.7% of the variance.

Research questions addressed

The focus of this section addresses the research questions posed in the introduction of this study. Statistics from individual questions of the survey and the TKLC Factor are analyzed to answer the research questions. The number of “Yes” and “Maybe Yes” responses were added to calculate a percentage of positive responses for each of the items under analysis. However, the tests of statistical differences were conducted on mean values on the items.

What are children's attitudes toward learning the Spanish language with the aid of computers?

Table 8 presents Items 1, 3, 6, and 20 which address the attitudes of students in regard to learning Spanish and Hispanic cultures with computers. All K-8 grade students were asked the first three items, while only 3-8 grade students answered item 20.

Table 8. Children's attitudes toward learning Spanish and about Hispanic cultures with the aid of computers

Statement	Percentage of Positive Responses
1. I like Spanish lessons on the computer.	<i>Grades K-2:</i> 84%* <i>Grades 3-8:</i> 69%
3. I want to keep learning Spanish using computers.	<i>Grades K-2:</i> 78%* <i>Grades 3-8:</i> 60%
6. I like using computers to learn about other people who speak Spanish.	<i>Grades K-2:</i> 75%* <i>Grades 3-8:</i> 52%
20. I like to use computers to learn about Spanish-speaking people. ^	<i>Grades 3-8:</i> 53%

* A t-test indicates significant differences between grades ($p < .001$). Grades K-2 students on average have more positive attitudes than grades 3-8 students.

^ Item not asked on Grade K-2 survey

The percentages of positive responses indicate that the majority of students (52% or more) have positive attitudes about learning Spanish and Hispanic cultures with computers. However, the percentage of positive responses from students in grades K-2 is larger than the percentage of positive responses from students in grades 3-8. A test of statistical difference between the mean response values indicates that those differences are significant in favor of K-2 students.

What are children's views on the application of computers to communicate with others, and / or searching the Internet when learning Spanish?

Table 9 includes Items 8, 10, and 11, which address the attitudes of students in regard to communicating with others using computers and searching the Internet. All K-8 grade students answered these two questions. The percentages of positive responses indicate that approximately one-third of the students (32% or below) agree with the statements about using computers to communicate with others (within project schools) and searching the Internet for information on Spanish-speaking countries. The percentage of positive

responses from students in grades K-2 is slightly larger than the percentage of positive responses from students in grades 3-8. A test of statistical difference between the mean response values to those two questions indicates that the differences are not statistically significant.

Table 9. Children's use of technology for communicating with others and searching the Internet

Statement	Percentage of Positive Responses
8. I use computers to talk to students at other schools.	<i>Grades K-2:</i> 32% <i>Grades 3-8:</i> 30%
10. I use computers to communicate with students from Spanish-speaking countries.	<i>Grades K-2:</i> 19%* <i>Grades 3-8:</i> 14%
11. I search the Internet for information on Spanish-speaking countries.	<i>Grades K-2:</i> 33% <i>Grades 3-8:</i> 32%

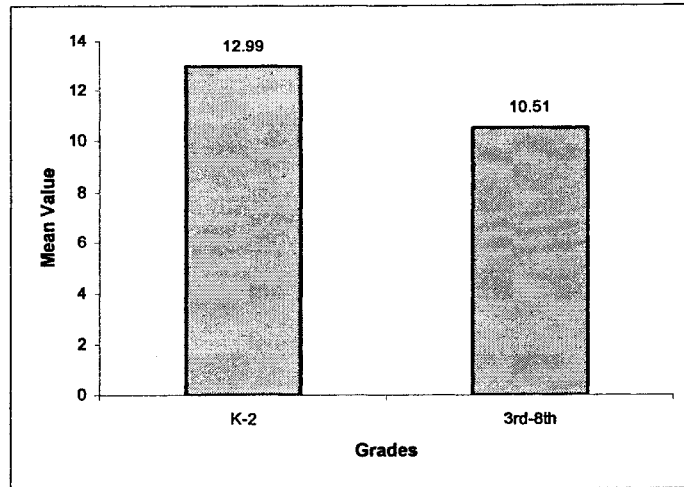
* A t-test indicates significant differences between grades ($p < .02$).
 Grades K-2 students on the average disagree more than grades 3-8 students that it happened.

How do students' grade level, gender, access to a home computer, and the number of years participating in the technology-enhanced classroom relate to students' attitudes toward using computers to learn the Spanish language?

Answers to this question are found in the statistical analysis relating to the "Technology for Language and Culture Learning" (TKLC) Factor. The TKLC factor includes Items 1, 3, 6, and 14 of the survey. For statistical analysis, a TKLC score was created by adding the score values of the four items comprising the TKLC factor. Thus, TKLC scores ranged from a minimum of 4, where "No=1" was the answer given to all four questions, to a maximum of 16, where "Yes=4" was the answer given to all four questions. This range of values makes possible to interpret the students' attitudes toward the use of technology for language and culture learning, and the effects on these attitudes of grade level (GRADE), gender (GENDER), home computer access (ACCESS), and the number of years the students has been participating in a technology classroom (YRPRT). Thus, for the

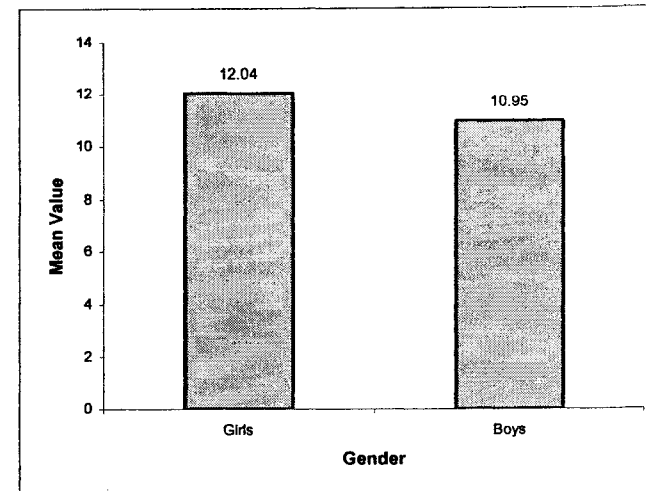
purpose of making comparisons between each of the levels on these variables, means and standard deviations for the TKLC factor are presented in Figures 1 through 4 for grades K-8 by GRADE, GENDER, ACCESS, and YRPRT. Analyses of variance tests were conducted to determine the statistical significance of the differences in the TKLC mean values by each of the independent variables.

Figure 1: TKLC Mean Values by Grade



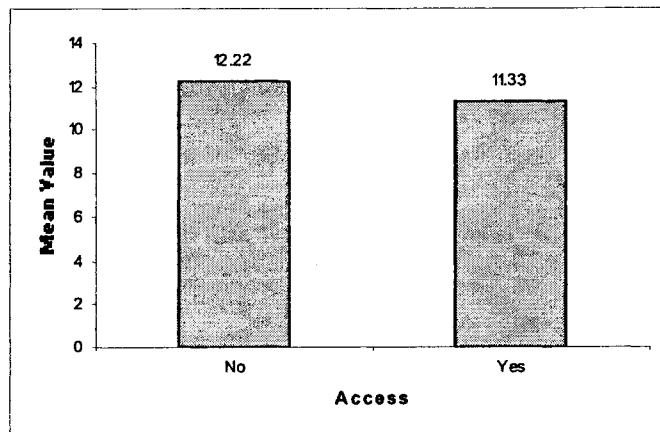
Mean Attitude Values are higher for K-2 grades than for 3-8 grades ($p < 0.001$).

Figure 2: TKLC Mean Values by Gender



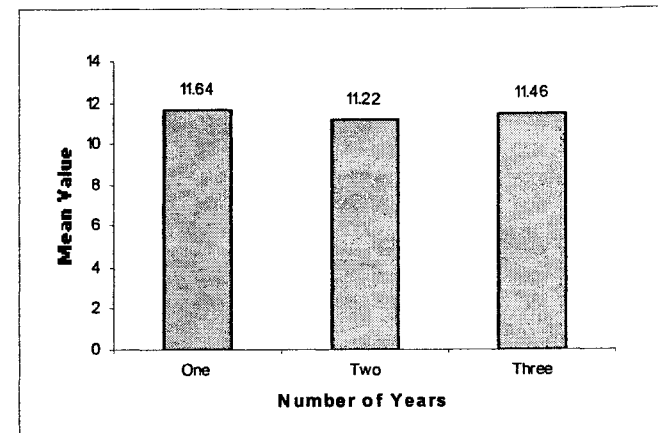
Mean Attitude Values are higher for girls than for boys ($p < 0.001$).

Figure 3: TKLC Mean Values by Home-Computer Access



Mean Attitude Values are higher for students who do not have a home computer ($p < 0.001$).

Figure 4: TKLC Mean Values by Years in Technology Classroom



Mean Attitude Values are higher for students who participated one year ($p = 0.165$).

TKLC by grade level

A one-way ANOVA was conducted on the TKLC factor to determine the effect of GRADE on the students' attitudes toward learning the Spanish language through technology-enhanced activities. The *F*-test indicates a statistically significant difference between the mean values of TKLC attitude scores of young and older students ($F = 42.54, p < 0.001$). As indicated in Figure 1, students in the lower elementary grade levels are more positive than students in the upper grade levels. This result indicates that grade level is a significant predictor of student attitudes toward studying the Spanish language using technology-enhanced activities. This is also consistent with results from research on children's attitudes on computer-assisted instruction (Miyashita, 1994), where, in general, younger children reported more positive attitudes than did older children when working with computers.

TKLC by gender

A one-way analysis of variance (ANOVA) was conducted on the TKLC factor with combined data from grades K-8 to determine the effect of GENDER on the students' attitudes toward learning the Spanish language through technology-enhanced activities. The *F*-test indicates a statistically significant difference between the mean values of TKLC attitude scores of girls and boys ($F = 48.95, p < 0.001$). As indicated in Figure 2, girls are more positive than boys. This result indicates that gender is a significant predictor of student attitudes toward studying the Spanish language using technology-enhanced activities. This is also consistent with the body of knowledge in second language acquisition research, where girls are more positive than boys about studying a foreign languages (Ellis, 1994). However, caution is needed to interpret the results of gender differences in computer-rich environments where there is still debate and the need for more research on this topic (Bhargava, Kirova-Petrova, & McNair, 1999; Chappell, 1996; Littleton, Light, Joiner, Messer, & Barnes, 1998; Weinman & Haag, 1999).

TKLC by home computer access

A one-way ANOVA was conducted on the TKLC factor with combined data from grades K-8 to determine the effect of ACCESS on students' attitudes toward learning the Spanish language through technology-enhanced activities. The F -test indicates a statistically significant difference between the mean values of TKLC attitude scores of students who have access to a computer at home and those who do not ($F = 15.47, p < 0.001$). As indicated in Figure 3, students without access to a computer at home have more positive attitudes toward learning the Spanish language than those who have access to a home computer. This result indicates that a lack of home computer access is a significant predictor of student attitudes toward studying the Spanish language using technology-enhanced activities. This also indicates that there might be a novelty effect. Students who do not have a home computer have more positive attitudes than those students who have a computer at home. This lack of home computer ownership may be interpreted then as a motivator for using computers at school, because they are new to those who did not have a home computer at the time of this study.

TKLC by number of years participating in the project

A one-way ANOVA was conducted on the TKLC factor with combined data from grades K-8 to determine the effect of YRPRT on students' attitudes toward learning the Spanish language through technology-enhanced activities. As indicated in Figure 4, the TKLC mean value is higher for students who have been in the project only one year. However, the F -test indicates no statistically significant difference between the mean values of TKLC attitude scores of students who have been one, two, or three years in the project ($F = 1.80, p = 0.165$), and the difference in mean values is not linear. Students in this project began participation at different grade levels. Thus, the effect of number of years of participation may have a compounding effect when attitudes are studied in combination with grade level. In other words, there may be a cumulative effect, as far as attitudes are concerned, based on seniority in the project, age, and grade levels.

Analysis of covariance (ANCOVA)

A one-way ANCOVA Model was estimated (Table 10) to explore the presence of any interaction among the attitude variables and the independent variables. The independent variables were GENDER, GRADE, ACCESS, and YRPRT. The dependent variable was technology for language and culture (TKLC), the first factor yielded by the factor analysis in the previous section, and the covariates were the remaining three factors—technology for communications (TKCOMM), technology for constructivism (TKCONST), and affective issues of technology (TKAFFCT). Because the individual differences and their attitudes under study are a combination of continuous and categorical variables, the ANOCOVA takes into account the fact that the covariates have different values for students, and makes everybody equal for the covariates. In other words, the covariates are adjusted to discard those differences and make all students equal. As Tabachnick and Fidell (1996) point out, “the purpose of [the ANCOVA] is to increase the sensitivity of the test of main effects and interactions by reducing the error term,” and by removing the undesirable variance associated with individual differences (p. 321).

A preliminary analysis evaluating the homogeneity-of-slopes assumption indicated that the relationship between the covariates and the dependent variables did not differ significantly as a function of the independent variables, except for GENDER. Table 10 summarizes the significant results of the ANCOVA. The strength of the relationship between each of the independent variables GENDER, GRADE, ACCESS, YRPRT, and the dependent variable TKLC was assessed by the value of partial Eta Squared, with GENDER accounting for 3.0% of the variance, GRADE for 5.1%, ACCESS for 1.2%, and YRPRT for 0.3% of the dependent variable, holding constant the three factors TKCOMM, TKCONST, and TKAFFCT. The only significant interaction found was between GRADE and YRPRT ($F = 2.10, p < 0.05$). That is, the students’ TKLC scores are affected by the combination of what grade they are in and what year of the project they began participation.

The means of the TKLC, adjusted for initial differences, and the covariates of TKCOMM, TKCONST, and TKAFFCT were different, as expected, for all levels of the independent variables. Female students had a larger adjusted mean ($M = 12.07$) than male students ($M = 11.05$). Students in grade K had the largest adjusted mean ($M = 13.65$),

followed by students in grade 2 ($M = 12.35$), grade 1 ($M = 12.06$), grade 3 ($M = 11.59$), grade 8 ($M = 11.60$), grade 4 ($M = 11.33$), grade 6 ($M = 10.66$), grade 5 ($M = 10.61$), and grade 7 ($M = 10.11$). Students who do not have access to a home computer had a larger adjusted mean ($M = 12.01$) than students with access to a home computer ($M = 11.10$). In terms of the number of years of project participation, the largest adjusted mean was for students with one year ($M = 11.89$), followed by students with three years ($M = 11.61$), and students with two years of project participation ($M = 11.00$).

Table 10. Analysis of Covariance (ANCOVA) — Dependent Variable TKLC¹

Source	df	Mean Square	F	p	Partial Eta Squared	Observed Power
Corrected Model	27	301.07	36.744	.000	.353	1.000
Intercept	1	876.92	107.03	.000	.056	1.000
TKCOMM	1	892.53	108.93	.000	.057	1.000
TKCONST	1	1974.62	240.10	.000	.117	1.000
TKAFFCT	1	87.76	10.71	.001	.006	0.905
GENDER	1	464.09	56.64	.000	.030	1.000
GRADE	8	100.21	12.23	.000	.051	1.000
ACCESS	1	177.87	21.71	.000	.012	0.996
YRPRT	2	24.75	3.02	.049	.003	0.586
GRADE & YRPRT	12	17.22	2.10	.014	.014	0.943
Error	1817	8.19				
Total	1845					
Corrected Total	1844					

¹Computed using Alpha = .05

R Squared = .353 (Adjusted R Squared = .344)

The R Squared value indicates that about 35.3% of the variation across students in TKLC is explained by the model components shown in Table 10. The only slightly smaller Adjusted R Squared value indicates that the model is efficient and does not include unnecessary components.

Follow-up tests were conducted to evaluate pairwise differences among these group means. The Bonferroni procedure was used to control for Type I error across the independent variables that have three or more groups (GRADE and YRPRT). There were significant differences in the group means of all grades except between the following pairs: grades 1 and 2; grade 3 and grades 4, 7, and 8; grade 4 and grades 7 and 8; grade 5 and

grades 6, 7, and 8; grade 6 and grades 7 and 8; and between grades 7 and 8. There were no significant differences in the group means of all levels of years of project participation (1, 2, and 3). Based on these ANCOVA results, the variables in this model contribute efficiently to its prediction validity.

The results from the ANCOVA did not change any of the statistical analyses in the previous sections. The ANCOVA added an interesting dimension to the results by indicating a significant interaction between grade and number of years in the project. When everybody's scores for the covariates are considered equal, the adjusted TKLC mean is higher for Grade K students who started in the third year of the project, and the lowest adjusted mean corresponds to Grade 7 students who started in the second year of the project.

Discussion

In response to a specially designed survey, children in this project revealed a variety of attitudes toward learning the Spanish language and culture with computers. In general, they expressed positive attitudes, but those attitudes varied according to age, gender, home computer ownership, and the number of years of experience using computers. According to the findings of this study, age, gender, and home computer ownership accounted for some significant differences in the attitudes toward using computers, in general, and using computers to study the Spanish language and culture, in particular. Young children (K-2 grades) were more positive than older children (3-8 grades), and girls were more positive than boys. Children without access to a home computer were more positive than children who had a computer at home. In contrast, the number of years children had participated in the project reflected various levels of children's attitudes, but those differences were not significant.

Miyashita (1994) found that children in first grade reported more positive attitudes than children in second grade. Findings from the present study confirmed that younger children in this project had more positive attitudes toward learning the Spanish language with computers than older children. Also, the type of computer-enhanced curriculum purpose appears to account for some variation in children's attitudinal differences. In Miyashita's study, computer use did not improve creativity and the desire to study.

However, in the present study, children reported very positive attitudes toward using computers to create, develop, explore, and solve problems.

There were some puzzling findings that deserve further discussion. For example, when using computers to promote cooperation, children in this project reported they work more with each other because of computer usage, yet they prefer to work alone. This finding may be interpreted as computers actually reducing children's enthusiasm, when children are required to work in groups. In the area of computer use for communications, almost one-third of the children in this project do not appear to have engaged in communication exchanges with students from other participating schools, and less than 20% of the students participated in some sort of communication exchange with students from Spanish-speaking countries. Teachers in this project were part of an email distribution list, and each week numerous postings on technology use and integration into the teaching of Spanish were offered by the project staff. In fact, the use of computers to communicate with others was encouraged by the trainers during the project, and teachers were asked to develop activities that integrated this strategy. The lack of computer use for communications in this project is likely to be attributable to the fact that teachers encountered challenges while engaging in email or desktop video conferences from school-to-school (Trayer, personal communication, 2005), and by the cautionary approach of parents, teachers, and administrators who do not favor the practice of children communicating with others through email, chat rooms, or the Internet due to safety concerns for children (Gardner, 2002; Kresses, 2001; Pownell & Bailey, 1999). However, a few email exchanges were accomplished as a class project through classroom teachers, who used their own individual email accounts. Since the project did not provide individual student accounts, this may also explain why children reported not using computers to communicate with others.

The Student Technology Survey is a way of quantifying the attitudes and usage of computer technologies to learn the Spanish language by K-8 grade students. The development of the Student Technology Survey was informed by previous research on attitudes of children learning foreign languages as well as research on attitudes by children using computers. This careful review of studies about survey research with children paid particular attention to the issue of judging children's ability to attend and to mark one

response out of four choices. The research process that was followed allowed for successful development the survey's two versions, validating its content, pursuing a feasibility study and a pilot study, and determining the survey's validity and reliability.

The validity of the two versions of the Student Technology Survey was evaluated first through content analysis of the items, as judged by experts in elementary education, foreign language teaching, and technology use. Construct validity of the survey's two versions was determined through an exploratory factor analysis that yielded four factors: technology for language and culture learning, technology for communications, technology for constructivism, and affective issues of technology. The reliability of the survey's two versions was obtained by means of the Cronbach alpha internal consistency coefficient, and the prediction validity was established through an ANCOVA model. The ANCOVA model was estimated with technology for language and culture learning as the dependent variable, the three remaining factors as covariates, and gender, grade level, home computer access, and the number of years children had been in a technology-enhanced classroom as fixed factors. The ANCOVA test indicated that the model components contributed efficiently to its prediction validity. The Student Technology Survey may be of value to researchers as an instrument to be used in combination with classroom observations. Some redesigning of the items is also possible as they may refer to particular CALL tasks, specific computer applications such as WebQuests, PowerPoint, Internet searching for information on Spanish-speaking countries, national and international email exchange projects, word processing, and Webpage design and development.

The two versions of the Student Technology Survey indicated that students participating in the IN-VISION project have positive attitudes and are motivated to keep using computers to learn the Spanish language. However, differences in attitudes were found and are based on students' grade level and gender. Young children (K-2 grades) were more positive than older children (3-8 grades), and girls were more positive than boys. Two explanations for these differences are offered. First, previous research on children's attitudes reports that young children are more inclined to provide responses associated with positive choices (Harvill, 1971; Miyashita, 1994). Second, the more positive attitudes reported by girls may be explained by how children ascribe to social norms (Zimbardo &

Leippe, 1991). In U.S. cultural norms the study of foreign languages may be considered to be a “female” endeavor, and communication is seen as a female-oriented task not associated with the action typical of male-oriented activities (Bhargava, Kirova-Petrova, & McNair, 1999; Chappell, 1996; Littleton, Light, Joiner, Messer, & Barnes, 1998; Tarlin, 1995; Weinman & Haag, 1999). More research is needed in the area of attitudinal differences by gender when technology is used to teach children to learn foreign languages.

The majority of the children in this study (67% or more) reported not using computers to communicate with other students within the project, while 81% or more of the students did not use computers to communicate with other students from Spanish-speaking countries. This lack of practice may be explained by strategic problems encountered while establishing communications via computer (Trayer, personal communication, 2005). Another reason may be the parental, school administrators, and societal interest in protecting children from inappropriate content or exchanges that expose children to unsafe situations online (Gardner, 2002; Kresses, 2001; Pownell & Bailey, 1999). A final explanation points at the need for more practice and teachers’ training in overcoming the challenges for classroom organization and collaboration when technology is used in communicative projects (Harris, 1998; Zhao & Frank, 2003). One successful example of an email exchange project between K-3 students in the U.S. and Spanish-speaking students from Argentina and Spain was reported by Doloff (1999). The project consisted of sharing a brown stuffed bear among the schools during three years. The bear began traveling from New Jersey to other schools in the United States, Argentina, and Spain. Students helped prepare the bear for traveling, made identification cards, made clothing items with paper, studied clothing vocabulary in Spanish, and used the bear in school activities. Teachers participating in the exchange received, sent, and read email messages to teachers and students in other participating schools. Doloff observed that as a result of the exchange project, students showed interest in reading notes in Spanish, reading magazines about Argentina, compared other schools to their own, saw pictures and drawings from students in other schools, and “made authentic linguistic and cultural connections” (p. 23) as a result of the email exchange.

In terms of computer ownership, children in this project who have a computer at home are not as positive as those who do not have access to a home computer, perhaps because they prefer tasks similar to what they might usually do on their home computer. On the other hand, children without a computer at home may have reported positive attitudes due to the novelty effect of first time computer use. Also, due to limitations of time and availability of computers in the school, the time on task may be a factor that impacts student attitudes toward the use of computers to study foreign languages. At school, students have less opportunity to engage in meaningful computer-related activities in the foreign language classroom, whereas at home, time and computer access may be unlimited.

The number of years that students had participated in learning Spanish in a technology-enhanced classroom accounted for some variance, although not significant, in children's attitudes. A factor that may account for these non-significant differences in attitudes is the fact that students in this project started their foreign language with technology experience at different grades of their elementary education.

Conclusions and Recommendations

This study found that elementary students had positive attitudes toward the use of computers to learn Spanish, although this positive attitude decreased with age. As indicated by the acceptable alpha coefficients, the Student Technology Survey is an example of gathering reliable data from very young children. This method has the potential to further similar research endeavors in areas such as how children learn languages and cultures, communicate with others outside their linguistic group, and engage in problem-solving and critical thinking practices through technology-enhanced activities. An immediate question raised by this study refers to the issue of its external validity, which can be tested through further research to see if the survey can be used for different languages, school settings, models of language teaching in elementary schools, and in different parts of the world. This study has contributed to advance Mayashita's (1994) early research on attitudes toward computers by children, and it is hoped that others pursue a similar large-scale national or international study. Similarly, further research is necessary to know whether generalizations of the findings of this study and the predictions made by the statistical model extend beyond

the small Midwestern rural elementary schools Spanish programs tested in this study to other program models and to large and urban schools in the U.S. and beyond.

Based on the findings of this study, some recommendations are offered to researchers and professional developers while studying and training teachers to use computers for educational practices. First, more research on gender, age, and computer use for language learning is necessary. If older children spend more time working and playing with computers at home, then a better design of instruction that incorporates fun or gaming aspects may be helpful to better motivate them to use computers to study a foreign language.

This study indicates that girls and younger children had more positive attitudes, but it is not clear what accounts for these gender and age differences. It may be that the tasks associated with studying languages using computers were more appealing to girls, are a novelty, have less activities considered school work, or are more appealing to younger children, for unknown reasons. Accordingly, CALL design and implementation will be improved with attention to the differences in age, gender, and curriculum purposes in the development of computer-based activities suitable for all children. In addition, a pre-post test design may be suggested for future studies to document changes within and among students.

Although a difficult and interesting area, more investigation on implementing language and cultural exchanges via computers is also necessary. Some studies have documented success with children who engage in email exchanges. However, this study indicated the majority of the children did not have the opportunity to participate in communication exchanges of this nature. Again, it is unclear why this is so, but it may be that teachers were unable to find more time during the day to type student messages and manage the exchange flow (Bransford, Brown, & Cocking, 2000; Zhao & Frank, 2003). It may be also due to safety concerns of children searching and communicating with others on the Internet. However, with current computer media capabilities, real-time communication with native speaker children is clearly an untapped resource of language input and culture for children.

As a final point, the Student Computer Survey, with some redesign of the tasks and curriculum purposes, has value to researchers as an instrument to be used in combination

with observations of students working with specific CALL applications in classroom-based foreign language learning contexts.

Acknowledgements

I would like to thank Dr. Marcia Rosenbusch, Director of the National K-12 Foreign Language Resource Center at Iowa State University, and Chris Milner, kindergarten teacher and Master teacher for the TechCo program of the Center for Technology in Learning and Teaching, also at Iowa State University, for providing insightful comments and critiques to earlier versions of the Student Technology Survey. Thank you to Andrés Henríquez and Linnie Green, from the Center for Children and Technology in New York, for sharing valuable information related to their experiences surveying and assessing young computer users. I also want to thank Jeanette Borich, elementary Spanish teacher, her 2nd and 5th grade students of Spanish, and Mr. Randy McMahon, elementary school principal, all of whom graciously participated in the pilot study of the Student Technology Survey. Thank you to Dr. Mack Shelley, Director of the Research Institute for Studies in Education at Iowa State University, for his invaluable expertise and for coaching me with the statistical analyses of the data that emanated from the Student Technology Survey. Thanks to Rema Nilakanta, Natalie Johnson, De Zhang, and Lily Compton, my classmates in the Ph.D. studies in Curriculum and Instructional Technology at Iowa State University, for their support in helping me communicate preliminary findings of my research. Also, I would like to thank Marie Trayer, Director of the IN-VISION project, for giving permission to conduct this research within the IN-VISION project. Finally, I want to express my gratitude to the teachers and students who participated in the IN-VISION project and answered the survey, providing invaluable data for this research.

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Appendix A: Student Technology Survey (Grades K-2)

Student's Name

Student Technology Survey
Grades K-2

Teacher's Name

Circle the face that best describes your feelings about each sentence.

	NO	MAYBE NO	MAYBE YES	YES
1. I like Spanish lessons on the computer.				
2. I like using computers to experiment, to discover, or to explore things.				
3. I want to keep learning Spanish using a computer.				
4. I like using computers to solve problems.				
5. I get bored when my teacher asks us to do things on the computer.				
6. I like using computers to learn about other people who speak Spanish.				
7. I work more with other students because of computers.				
8. I use computers to talk to students at other schools.				
9. When I am using a computer, I like to work alone.				
10. I use computers to communicate with students from Spanish-speaking countries.				
11. I search the Internet for information on Spanish-speaking countries.				
12. Working with computers helps me think better				
13. I like using computers to create, design, or to invent things.				
14. The computer activities I learn in Spanish help me be more patient with people who speak other languages.				
15. I have a computer at home.				

Appendix B: Student Technology Survey (Grades 3-8)

Student's Name

Student Technology Survey
Grades 3-8

Teacher's Name

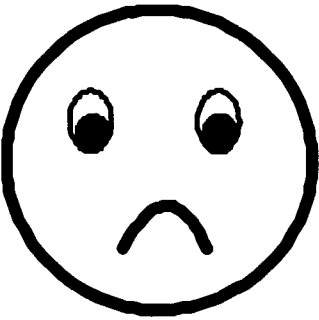
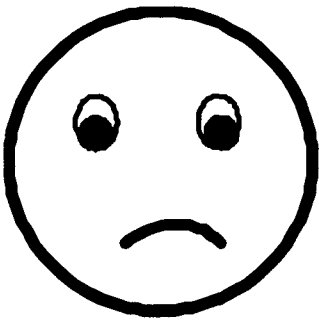
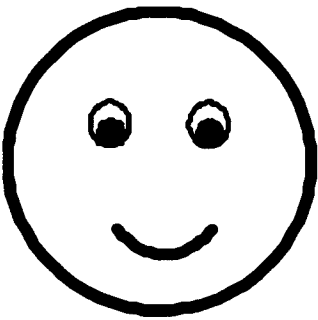
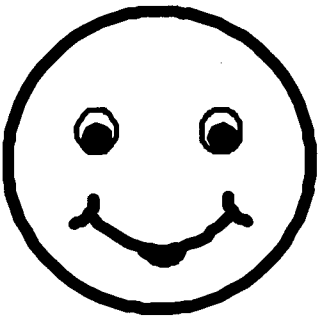
Please check the option that best describes your feelings about each statement.

Statement	NO	MAYBE NO	MAYBE YES	YES
1. I like Spanish lessons on the computer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I like using computers to experiment, to discover, or to explore things.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I want to keep learning Spanish using a computer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I like using computers to solve problems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I get bored when my teacher asks us to do things on the computer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I like using computers to learn about other people who speak Spanish.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I work more with other students because of computers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I use computers to talk to students at other schools.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. When I am using a computer, I like to work alone.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I use computers to communicate with students from Spanish-speaking countries.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. I search the Internet for information on Spanish-speaking countries.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Working with computers helps me think better.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. I like using computers to create, design, or to invent things.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. The computer activities I learn in Spanish help me be more patient with people who speak other languages.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. I have a computer at home.	<input type="checkbox"/>			<input type="checkbox"/>
16. Students in my classroom are collaborating with other classrooms to solve problems, collect and analyze data, or create stories, presentations, and artwork.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. I know how to separate fact from opinion in the information I access on the Internet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. I know how to use the Internet safely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. When we use computers for Spanish, we have more class conversations and participation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I like to use computers to learn about Spanish-speaking people and countries.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

STUDENT TECHNOLOGY SURVEY (Spring 01)
IN-VISION Iowa/Nebraska Technology Challenge Grant

1. Hand out one Student Technology Survey to each student.
2. Show the children the large smiley faces below. While pointing to the frowning face, tell students that the frowning face means "no". Do the same for the next frowning face, and tell them that it means "maybe no". Continue to the next happy two faces, tell them that they mean "maybe yes" and "yes" respectively.
3. Read each statement aloud to the students and ask them to circle on their paper the frowning face if their answer is "no," the next frowning face if their answer is "maybe no", or one of the next two happy faces if the answer is "maybe yes" or "yes".
4. Tell them that there are no right or wrong answers since many children have different opinions.
5. Please be sure students' names and your name are written on the survey.

All responses will be kept confidential. ¡Muchas Gracias!

NO	MAYBE NO	MAYBE YES	YES
			

Appendix D: Directions for Teachers (Grades 3-8)

STUDENT TECHNOLOGY SURVEY (Spring 01) *IN-VISION Iowa/Nebraska Technology Challenge Grant*

Hand out the Student Technology Survey to each student. Tell your students that the survey has some statements that some people agree with and others disagree with. Also, tell them that there are no right or wrong answers since many people have different opinions. Next, demonstrate for your students how to give their opinion about each statement by circling the choice below each statement that best indicates how much he/she disagrees or agrees with it.

Read this sample item aloud and show how you circle the choice beside the statement that best indicates your feeling.

Statement	NO	MAYBE NO	MAYBE YES	YES
A. Dragon Ball Z is the best television cartoon in the world.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tell your students that their choice may be different from what you or other students circle because their choice indicates their own opinion about the Back Street Boys. **Please emphasize that there is no right or wrong choice.** All that is important is that they show what their personal opinion is.

For each of the items on the survey ask your students to read each statement carefully and circle their true feelings.

Once the students have marked their choices, collect the surveys and make sure the information about students' names, your name, and the school name is complete.

¡Muchas Gracias!

Appendix E: Factor Loadings

Factor Loadings Following Maximum Likelihood Extraction Followed by Oblimin Rotation with Kaiser Normalization

ITEMS	FACTORS			
	Technology for language and culture learning (TKLC)	Technology for communications (TKCOMM)	Technology for constructivism (TKCONST)	Affective issues of technology (TKAFFCT)
(TKLC) items				
Q3: I want to keep learning Spanish using a computer.	0.83	0.12	0.28	0.01
Q1: I like Spanish lessons on the computer.	0.82	0.12	0.19	-0.01
Q6: I like using computers to learn about other people who speak Spanish.	0.71	0.26	0.32	0.09
Q14: The computer activities I learn in Spanish help me be more patient with people who speak other languages.	0.64	0.32	0.31	0.04
(TKCOMM) items				
Q10: I use computers to communicate with students from Spanish-speaking countries.	0.25	0.80	0.04	0.09
Q8: I use computers to talk to students at other schools.	0.00	0.73	0.16	0.05
Q11: I search the Internet for information on Spanish-speaking countries.	0.34	0.58	0.15	0.02
(TKCONST) items				
Q2: I like using computers to experiment, to discover, or to explore things.	0.17	0.10	0.65	-0.22
Q4: I like using computers to solve problems.	0.25	0.09	0.65	0.04
Q13: I like using computers to create, design, or to invent things.	0.19	0.15	0.60	-0.01
Q12: Working with computers helps me think better.	0.36	0.07	0.59	0.34
Q7: I work more with other students because of computers.	0.37	0.22	0.41	0.10
(TKAFFCT) items				
Q9: When I am using a computer, I like to work alone.	0.01	0.03	0.12	0.77
Q5: I get bored when my teacher asks us to do things on the computer.	-0.05	0.06	-0.31	0.58

GENERAL CONCLUSIONS

The U.S. is still in the early stages of expanding language learning in the elementary schools. Legislative mandates now require the study of foreign language and nine states include foreign language as a core context area at the elementary school level. There is also growing interest in foreign language instruction, with an increasing number of publications on the subject as discussed in the introductory chapter. This concluding chapter summarizes the research findings from the three papers and ends by presenting a research agenda to inform CALL integration in elementary foreign language classrooms. First, a short synthesis of the findings is presented.

This dissertation developed a framework of multiple perspectives for CALL evaluation of elementary classrooms out of a critical review of the literature on CALL evaluation (Paper 1). The framework proposed that the design, use, and evaluation of CALL in elementary classrooms should have the perspectives of experts, teachers, and students in addition to CALL developers. These perspectives were then researched in two further papers. Paper 2 gave elementary teachers a voice through the products that they produced for teaching and learning Spanish language and culture with CALL in their K-6 classrooms. A panel of experts in technology integration in elementary education, language learning, and Spanish language were given a voice through their evaluation of the teachers' products. Paper 3 gave K-8 children a voice in evaluating CALL activities in which they were involved when their teachers used the products they had produced and that were evaluated in paper 2.

The review of the literature noted gaps, including studies of elementary educational use of CALL and interpretivist approaches to evaluation. The framework was useful for the study of CALL evaluation following the IN-VISION project, which had involved 14 schools in the U.S. Midwest. The multiple perspectives provided alternative views of the reality of CALL implementation in elementary classrooms. The teachers' products demonstrated that they were becoming comfortable with the use of technology and were prepared to collaborate with other teachers, but the potential for teaching and learning of Spanish language and culture was weak. The experts recommended that teachers be given

more time to develop their expertise with CALL and Spanish language and culture, and they recognized that the teachers' training was only the first stage in that process.

Although the children were enthusiastic about their use of CALL, significant individual differences emerged, including gender, with boys less enthusiastic than girls, and age, with older children less enthusiastic than the younger ones. Several factors emerged from the factor analysis of the two versions of student survey (K-2 and grades 3-8), including "technology used for communication" and "technology used for learning Spanish language and culture". These factors require further research, in which the successful development of a survey for younger children (K-2) may be useful. A review of the evidence from these multiple perspectives supports the experts' view that the teachers could improve their practice with more student-centered activities, in which students are encouraged to engage more autonomously in language learning through CALL resources. Together, these papers contribute to strengthening the foundation for research on CALL in foreign language programs at the elementary school.

Summary of Findings

The literature reviewed in Paper 1 showed that to date, no one in the field of foreign language at the elementary school (FLES) has identified what principles might be useful for practice-oriented CALL that is relevant for young learners, and that very little research had been published in the area (Liu, Moore, Graham, & Lee, 2003; Zhao, 2003). In this context, the first paper, entitled "CALL evaluation for early foreign language learning: A review of the literature and a framework for evaluation," is a critical review of the literature between 1980 and 2005 on the evaluation of resources for CALL, with a particular emphasis on elementary education. This paper links the literature on CALL evaluation with that of project evaluation more generally; it proposed using factors of multivocality, contextualization, and interpretation to provide a framework for future evaluation of CALL materials for K-6 learners. An original framework for CALL resource evaluation is proposed. This paper critiqued single-sided approaches that are used commonly in the evaluation of CALL materials for foreign language education. These approaches have resulted in evaluations that focus on the effectiveness of CALL for learning, and promote the use of checklists that lead to generalizations that may not be applicable to specific

contexts. Evaluation that takes only one perspective is limited in that it does not address what teachers and students do with CALL when situated in a classroom. This critical review of the professional literature between 1980 and 2005 in the field of CALL evaluation revealed that examples of interpretivist evaluations are lacking. In response to the lack of an interpretivist perspective in CALL evaluation, the main purpose of this paper was to present an alternative framework to the evaluation of CALL materials for young learners.

A redirection of the focus of CALL evaluation was proposed, whereby teachers would be trained to develop expertise in evaluation and selection of materials from the multiple perspectives of developer, teacher, and student. Equally important in CALL evaluation is to include multiple views and reflections of what teachers and students do with CALL materials and how they feel about using them.

Investigating the interpretivist paradigm itself not only would aid teachers to become familiar with proposed foreign language education epistemologies, but also would support teacher empowerment with the view of teachers as researchers and active participants in the development and evaluation of CALL resources. The integrated multiple perspective framework provides guidance to developers and teachers who aim to integrate CALL, and strengthens the connection between research and practice in foreign language education.

The second paper, "Experts' views of novice K-6 language teachers' efforts in technology integration across the curriculum," presents a phenomenological investigation of K-6 teachers' CALL projects that resulted from a teachers' professional development program on CALL integration in a foreign language in elementary school. This paper makes recommendations for the design, development, use, and evaluation of CALL resources to address explicitly the components of an interpretivist paradigm. It also suggests innovative directions related to the professional development for foreign language elementary education.

In this study, classroom teachers who were new to both Spanish language and technology integration received training to integrate thematic instruction supported by technology into their classroom activities. These teachers developed integrated thematic projects and those projects were critiqued by a panel of experts who had expertise in foreign language education and technology. Experts' recommendations for teachers' training

included more guidance and clear expectations for teachers on student-centered design, thematic planning, and a closer look at the contexts for which technology-enhanced projects are developed. To make the development process of these projects more manageable for teachers, training would be better focused on teaching one or two of these aspects rather than all three (technology use, Spanish language and culture, and thematic pedagogy). Experts noted that quality will improve with time and further teacher training.

This study suggests that CALL designers should pay attention to the context of and the participants in foreign language learning. There is need for guidance in applying appropriate strategies to teach foreign languages to children with technology. Teachers appear to need more than a minimal understanding of language, culture, and technology to move into the integration of technology and content from multiple areas, such as foreign language in this study. Experts recommended that teachers move from teacher-centered to student-centered designs incorporating CALL.

The third paper surveyed K-8 students. “Elementary students’ views on learning Spanish with computers” found that students participating in the IN-VISION project had positive attitudes and are motivated to keep using computers to learn the Spanish language. However, differences in attitudes were found based on students’ grade level and gender. Young children (K-2 grades) were more positive than older children (3-8 grades), and girls were more positive than boys. More research is needed in the area of attitudinal differences by gender when technology is used to teach foreign languages to children. The majority of children in this study (67% or more) reported not using computers to communicate with other students within the project, and 81% or more of the students did not use computers to communicate with other students from Spanish-speaking countries. This lack of practice may be explained by strategic problems encountered while establishing communications via computer, as well as interest from parents, school administrators, and society generally in protecting children from inappropriate content or exchanges that expose children to unsafe situations online. In addition, these results suggest a need for more practice and teachers’ training in overcoming the challenges for classroom organization and collaboration when technology is used in communicative projects. For example, Harris (1998) provides a guide for teachers on various structures for “telecomputing” activities useful to enhance foreign

language instruction. In addition, communication activities among students and teachers in classroom contexts using teacher-designed CALL materials need further study under more favorable conditions.

In terms of computer ownership, children with a computer at home are not as positive about learning Spanish with computers as are those who do not have access to a home computer. Computer tasks performed at home may be more for entertainment than for education. Also, children without a computer at home may have reported positive attitudes due to the novelty effect of first-time computer use. Due to limitations of time and availability of computers in the school, as was the case in the IN-VISION project, the time that is dedicated to learn Spanish (20 to 30 minutes per week throughout the school year) is very limited, and this time constraint may impact negatively student attitudes toward the use of computers to study foreign languages.

The Student Technology Survey is a rare example of gathering reliable data from very young children. This method has the potential to further similar research in areas such as how children learn languages and cultures, communicate with others outside their linguistic group, and engage in problem-solving and critical thinking practices through technology-enhanced activities. However, attention is needed to improve the survey items. Specifically, a balance between the number of attitudinal and application items would be desirable, as well as consideration of Web-based CALL. Further research also is necessary to know whether generalizations of the findings of this study and the predictions made by the statistical model extend to other foreign language program models and to other populations, such as large and urban schools in the U.S. and abroad.

This summary of the three papers is now followed by a brief discussion of future research, and this concluding chapter ends with a brief research agenda that has been informed by the dissertation.

Suggestions for Future Research

Future research on CALL for children needs to be informed by recent research trends in technology and education, such as: strong advocacy for better research designs in project evaluation, new methods for assessing innovation of technology projects, attention to

project-based assessment research in determining the effect of technology-enabled activities on students' learning, emphasis on teacher education and training, professional development, reflective practices in teacher preparation and teacher education programs, and use of hybrid approaches (qualitative and quantitative) to research methodologies (Davis & Thompson, 2005; President's Committee of Advisors on Science and Technology, 1997; Thompson, 2005).

To improve CALL in the future, design and development of CALL materials must be responsive to teachers' varied approaches and types of foreign language programs, and the teaching methodology manifested in the materials needs to be defined explicitly. Since little is known about children's foreign language acquisition in classroom contexts, a research agenda for early foreign language teaching and learning is needed. Due to the lack of knowledge about language learning by children in a foreign language context (García Mayo & García Lumberri, 2003), there is a tendency to accept that adult second language acquisition principles apply to teaching and learning foreign languages in elementary schools. This dissertation research on the use of CALL in grades K-8 strengthens the case for stronger lines of inquiry in foreign language learning contexts with elementary education. In addition, the use of CALL is broadening to include Web-based environments.

More research on gender, age, and computer use for language learning is recommended. This dissertation indicated that girls and younger children had more positive attitudes, but it is not clear what accounts for these gender and age differences. Research and development of strategies to maintain older children's positive attitudes while using computers for educational practices would be valuable to inform this further. More investigation on implementing language and cultural exchanges via computers is also necessary. Some studies have documented success with children who engage in email exchanges (Doloff, 1999).

As Donato, Tucker, Wudthayagorn, and Igarashi (2000) point out, the lack of a research base in the field of foreign language learning at the elementary schools is an issue of concern in the field of foreign language education in the U.S. By extension, the absence of a research agenda in CALL for young learners (Liu, Moore, Graham, & Lee, 2003; Zhao, 2003) has inhibited the integration of CALL materials in meaningful ways to the foreign

language experience of K-8th grade learners. It is clear that a research agenda is needed, and that more studies of CALL in action that focus on young learners paired with more involvement by teachers in the active design and delivery of CALL resources and in the research process are desirable. Such a research agenda needs to include replications of CALL resource evaluation in classroom-based settings with the improved approach suggested in this dissertation.

In summary, a research agenda informed by this dissertation in the field of CALL use at the elementary schools has the following components:

- Application of the framework developed in the first paper to inform research designs.
- Development of a research approach and instruments to measure young children's attitudes toward learning foreign languages with the aid of computers.
- Investigation of CALL use across gender, age, curriculum, and technology applications.
- Research and development of strategies to increase the impact of CALL, especially for older children.
- Professional development approaches that include CALL evaluation for foreign language teachers.

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